Telephony.

THE AMERICAN TELEPHONE JOURNAL

Comprising Telephony, American Telephone Journal, Telephone Weekly, Telephone Magazine, Telephone Securities, The Telephone, Sound Waves

PUBLISHED WEEKLY BY THE TELEPHONY PUBLISHING COMPANY
MONADNOCK BLOCK, CHICAGO

H. B. McMEAL, PRESIDENT AND EDITOR. H. D. FARGO, SECRETARY AND TREASURER. J. C. KELSEY, VICE-PRESIDENT AND FINANCIAL EDITOR.
S. R. EDWARDS, TECHNICAL EDITOR. J. R. HASTIE, ADVERTISING MANAGER. W. E. RAYMOND, SUBSCRIPTION MANAGER.

Entered as second-class matter September 4, 1908, at the post office at Chicago, Ill., under act of March 3, 1897

Volume 68
Number 16

CHICAGO, SATURDAY, APRIL 17, 1915

Subscription—10 Cents a Copy
$3 a Year U. S., Cuba and Mexico
$4 Canada, $5 Other Countries

A Similar Case.

Probably more interest is felt by telephone men today in the attitude which the government will take with regard to the alliance of the American Telephone & Telegraph Co. and the Western Electric Co., than in any other question which touches their business. The ordinary observer has no doubt at all that this alliance is grossly unfair and directly contrary to the rules of fair play in the commercial world. Whether or not, however, the Bell's high-priced legal staff can dodge the rocks and reefs of illegality is another question. The Federal anti-trust laws are open to various interpretations. We can rest assured that the lawyers who look to 15 Dey street for their bread and plenty of butter—perhaps pie would be a better term to designate their fat fees—will leave no stone unturned to continue this monopoly-breeding combination.

Legal proceedings before the United States Supreme Court regarding the International Harvester case throws an interesting light on a situation which has many points of similarity to this problem which Independents are now giving careful attention. The Federal government, through Attorney General Gregory, denied point blank the defense of the Harvester combine whose attorneys sought immunity on the ground that it was a "good" trust. By "good" trust, they meant that the Harvester corporation had not raised prices, lowered wages, degraded the quality of its products or oppressed its competitors.

In reply, the Attorney General declared that there can be no "good" trust; that any combination which controls a field of trade is thereby interfering with the natural operation of the law of competition and must, therefore, be held illegal. If such a combination is to be permitted, he said, and only the demonstrated "abuse" of its power is to be prohibited, then the "despotic organization of industry" will be enthroned, the great rush toward concentration will be renewed and, if it is continued, liberty itself will be imperiled.

The Attorney General cited two facts as sufficient to justify the dissolution of the Harvester combine: It sells to American farmers not only 80 or 90 per cent. of their harvesting machinery, but also most of their wagons, harrows, corn shellers, farm engines, hay presses, etc., etc. Secondly, it attained this dominating position in its field not through any process of natural "growth from within" but through the combination by a single stroke of a number of large competing concerns.

Does not the Bell-Western Electric combination furnish a parallel case? Figures in its last annual report show that the Western Electric Co. sold between 80 and 90 per cent. of the telephone equipment used in the United States last year. Furthermore, through their business allies, the Western Electric sought to control the market for poles, insulators, wire, batteries—in fact everything used in the telephone business.

The Western Electric Co. has sought to stamp out competition in these lines and through the unfair advantage which it holds by reason of its connection with the Bell company, it has great opportunities to play the part of a monopoly in the telephone field. The International Harvester case has developed the fact that the government has no objection to "growth from within," but is unalterably opposed to any act intended to stifle competition "from without." If the present administration is sincere in its determination to preserve competition, it certainly will take official notice of the Bell-Western Electric iniquitous alliance. Bolstered up and strengthened by the vast volume of business given it by the Bell operating companies, with no sales expense, the Western Electric is able to roam the telephone field and wage a cut-throat fight against Independent competitors.

The Bell company owning public franchises, has no moral right to be engaged in the manufacturing business. We also believe it has no *legal* right, and steps should be taken to determine that fact. For decency's sake, the Bell itself should voluntarily cut loose from its manufacturing branch, and not wait until the government forces a separation as it did with regard to the Western Union. It would be folly, however, for the Independents to wait for the Bell to make a move in this direction. They should take immediate action to bring this unfair condition to the attention of the proper authorities. When this is done, it is our opinion that the Bell lawyers will be more busily occupied than are the attorneys who are now engaged in polishing up the escutcheon of the Harvester trust.

Pull Won't Get You a "Good" Job

By HERBERT KAUFMAN

If you're fool enough to remain in an organization where merit alone does not determine promotion, you don't possess the essential enterprise to succeed in one where it does.

Don't pull that old copybook gag! It has ruined careers by the thousand. Whoever made anything out of gathering moss? Roll on and round out with experience.

We aren't born roadwise. Every traveler must learn his routes. It isn't an indictment against intelligence or eventual reliability to make a few false starts, but it's indisputable proof of stupidity to proceed a step farther after you realize that you're headed in the wrong direction.

You're simply marking time now—tramping a treadmill pumping ability into a bottomless bucket. It's a case of action without progress. You're holding a job and the job is holding you. Quit. You can't win against marked cards. There's no opportunity for the outsider when the deck is fixed.

It isn't a gamble for you to face the world without assurance of an immediate situation. There is no chance in taking one where you have none. Besides you're investing your energy and aspiration in a losing cause.

Neither little businesses nor big corporations can long endure competition, except through competent management. And wherever pull counts before push, bankruptcy is knocking at the door.

One of the most significant facts in connection with the majority of successful concerns, is the absence of relatives of founders and controlling stockholders from posts of direction. The shrewd old gentlemen who built up our greatest industries and mercantile establishments, mainly made their money and way by pitting empty pockets and filled heads against filled pockets and empty heads.

They are sanely protecting their declining years and securing the future of their children by employing energetic and resourceful strangers to conserve the sources of their wealth. They can easily afford to indulge their sons with yachts and other little playthings, so long as they do not permit them to play the deuce with the institutions which they are not fitted to conduct. If you are a first class man, capital and you are equally anxious to locate one another.

What you spring from doesn't count. What you spring at is the important thing.

The kind of jobs that are handed out at the request of friends and acquaintances are not worth much or they wouldn't be handled so carelessly. When Clarence Cutler brought a letter of introduction to Cyrus Simmons, the old man threw it in the waste basket.

"If you rely on that," he said, pointing to the torn scraps. "you haven't enough self-confidence for me to rely on you. When it comes to dollars and cents, I don't care who you are, but what you can do.

"The only letters that count here are references, and I don't read 'em. That's my employment agent's duty. Go around and see him, and don't mention your mistake of trying to go over his head. Men who get in with a jimmy, aren't popular around here."

Copyright, published by permission Chicago Tribune.

Loading Coils—Principles, Design and Construction

The Types of Coils and Their Uses—General Principles of Construction—Methods of Winding—The Iron Wire of the Coil and Its Treatment—Insulation of Core and Windings—Construction of the Different Coils

By W. N. Furthmann

A loading coil is a toroidal coil, primarily designed as an inductance regulator or stabilizer in a telephone circuit. Dr. M. I. Pupin's explanation of the function of his invention may be briefly described as follows:

If a string of a given length is fastened at one end, it will be noted, upon placing it in motion, that the wave lengths of the string are very irregular in shape, size and number, even though the force applied is even and regular. If the string is loaded with wax balls, varying in weight and size and placed at irregular distances along its length, it will still be noted that the previous condition continues to exist to a more or less degree. It will be found, however, upon loading the string with balls of equal size and weight equally distributed along its length, that the wave lengths become very uniform. This may be said to be the object of a loading coil in a telephone circuit, namely to obtain uniform wave lengths of the voice currents.

The relation of a loading coil to an ordinary subscriber's circuit and also the connections which are used in a unit of loading are shown in Fig. 1. In the diagram a phantom and four side circuit coils are illustrated. The two coils *S* on either side of the center with the coil, *P*, comprise what is termed a unit of loading.

Loading coils are divided into phanton and non-phanton types for both aerial and cable use. The cable coil is ordinarily installed underground while the aerial coil is used on open wire lines. Both the phantom and non-phantom types of coils are used on aerial and cable lines. In a phantom circuit, the two metallic circuits are known as side circuits. Special loading coils known as side circuit phantom coils are inserted in the metallic circuits and another loading coil known as the phantom coil, is used for loading the phantom circuit.

A loading coil consists of a core of iron wire, torodial in form, upon which is applied a copper wire winding. This winding is wound on sections of the core. The spacing of these sections is obtained by means of fibre washers, and it is important that these sections be equal in size. In the old or non-phantom type of aerial or cable coil, each section contained an inner and outer winding. In the new or phantom type of coil, each section contains a complete inner and outer winding. In Fig. 2 is shown a cross section of a phantom side circuit coil consisting of a core and a complete inner and outer winding applied in two sections of the coil.

The size of a loading coil is determined by the degree of inductance which it is required to meet. Due to the necessity of a varying degree of loading, depending upon the circuit conditions involved, it is necessary to design loading coils for very light, light, medium, heavy, and very heavy degrees of loading. This variation in the size of a loading coil applies to all types of coils, whether they are to be used for aerial or cable service and whether they are of the non-phantom or phantom types.

The electrical requirements of a loading coil are, of course, of considerable importance. In order to meet the rigid transmission specifications and at the same time permit the manufacture of the coils under commercial conditions, it is necessary to specify the electrical requirements in minimum and maximum limits. While it is true that in these electrical specifications, line or transmission conditions are chiefly considered, it is particularly true of a loading coil that the electrical tests applied, in every instance, determines also whether the mechanical operations involved in the manufacture of the coils have been satisfactorily performed.

The iron wire of the core is tested for specific resistance and permeability; the line windings for direct current resistance and inductance; and the completed coil for effective resistance, insulation resistance and, in the case of the phantom coil, for cross talk.

The aerial type of coil must withstand a breakdown test of 8,000 volts alternating current and the cable coils from 500 to 1,000 volts alternating current. The breakdown tests to which the coils are submitted, in a great measure, determine the type and strength of insulation which shall be used.

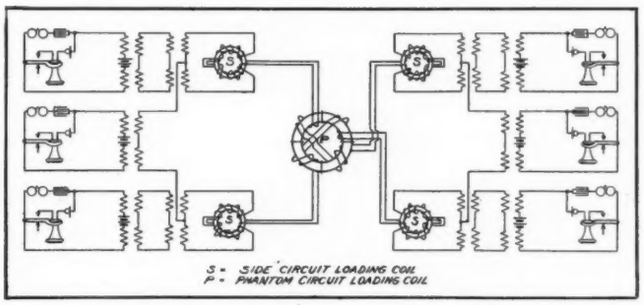


Fig. 1. Relation of Loading Coils to Subscriber's Circuits.

It is also true of a loading coil that its efficiency depends upon its weakest link. No matter how efficient and highly scientific in result, a loading coil may be, it is clear that in the manufacturing process, the strength of its mechanical construction must also be closed to any questionable operations. The methods of drying, baking and impregnating a loading coil, therefore, must also depend upon its mechanical construction and the type of insulation which is used in its manufacture. The humidity of the atmosphere, moisture on the hands of the operator and the hydroscopic nature of the many and various raw materials of which a loading coil is composed, all tend to increase the difficulties which are experienced in attempting to remove moisture after the coil is wound, and ready for assembly in the loading coil case.

The baking of a coil, insulated only with ordinary linen insulation, may be successfully accomplished in a steam-heated oven at a temperature of 220 degs. Fahr. provided suitable regulators are used for the purpose. With varnished linen or other similar insulation used on the larger types of coils, a more powerful means is required, such as vacuum drying equipment, provided with apparatus suitable for air drying after the vacuum operation is completed. In the case of a coil designed to be installed in a loading case for aerial service, a ½ inch manila rope is then wrapped around the coil. It is next submitted to an oil impregnating treatment under vacuum. The aerial type of coil is then placed in an iron case. It is covered with the oil compound in which it was treated and the case sealed with asphaltum compound, the leads being brought out through glass and porcelain bushings.

The cable type of coil is dried and treated in a similar manner but the coils are assembled and installed in a case which is very much larger in height and diameter. A cable loading case is equipped with wooden dowels upon which the coils are assembled, an iron and fibre washer being used between the

coils. The number of dowels in a case depends upon the capacity and the purpose for which the coil is to be used. Certain types of cases contain only one dowel, as many as 15 coils being assembled in one case. Other types of cases contain from two to seven dowels, their ultimate capacity ranging from 20 to 98 coils.. Cable coils are wired with what are termed dowel cables. These are connected in a pocket chamber at the top of the case to the case cable stub.

After the coils are assembled, the case is almost filled with the oil compound in which the coils were treated and the cover placed in position with a copper gasket for sealing where there is liability of the case being submerged in water. After the coils have received their final test, an asphaltum cement is poured through two holes in the cover. Suitable plugs are provided for finally sealing the case, and a wiped joint is made on the nipple through which the cable stub projects.

Due to the water, ice and other injurious elements to which a loading case is exposed when used for either aerial or cable service, the casting of the case is treated with a turpentine preparation before and after the case is assembled. This treatment is applied so as to thoroughly impregnate the pores of the casting, giving an outer surface to the casing which will prevent it from becoming chipped or scratched before and after it is in service.

Loading Coil Construction.

A loading coil is toroidal in form not only to control the lines of magnetic force, but also to provide means for obtaining equal windings. These windings must not only be equal in direct current resistance and induction, but also in effective resistance and cross talk. This equality is provided for in the construction of the coil not only from a mechanical standpoint, but also to prevent an electrical unbalance during the manufacture and after the coil is placed in service. A form of coil therefore must be adopted which will permit of many mechanical as well as electrical combinations, to satisfactorily meet the highly technical requirements involved in the time constants of a loading coil.

This is primarily accomplished by sub-dividing a toroidal coil into sections by means of fiber washers, two of these washers being used in the side circuit phantom coil and four in the phantom coil. This method of distributing the winding is also followed in both the aerial and cable coils, because it is necessary to obtain equal inductance of the windings, a quarter of one per cent. variation being the usual specification. This requirement ,however, is not arbitrary, it being necessary to increase the allowance for the adjustment of cross talk, when the coil is ready for its first test. In this form of coil, the effective resistance may be reduced to a minimum, an important factor in manufacture, especially when the length of line is considered.

There are as previously stated, a number of degrees of loading, the necessity for which will be more fully described later. The range in inductance is approximately from .08 to .28 henry.

The size of the core of a coil is determined by the degree of loading, 65,000 to 95,000 turns of No. 38 B. & S. gage, iron wire being used for the purpose. In order to keep the hysteresis losses to a minimum, and thus in turn reduce the effective resistance, it is necessary to insulate each strand of wire with either black enamel, or some other cellulose shellac compound, depending upon the degree of heat which is to be used in the baking process when applying the insulation.

The permeability of the iron wire, of course, determines its losses and the manufacturer of No. 38 B. & S. iron wire from pigs, each composed of very similar elements, is a very complex proposition. This is especially true when a manufacturer must obtain one grade of iron wire having a permeability of 65 to 75 and another of the same size having a permeability of 90 to 100. One degree of hardness may easily become mixed with the other. Tests are therefore necessary with a permeammeter at both shipping and delivery points to check against any possible mistake. The solution of this difficulty, however, like a good many others, lies within itself.

It is important to eliminate the liability of mixing the grades of wire, for 95 permeability wire, when used in a coil, destroys its efficiency or lessens it as soon as the coil becomes magnetized. This is so unless the wire is drawn from a pig made up of elements held very close to the specifications, especially in regard to silicon. In other words, if the manufacturer is held to a delicate metallurgy scale, the cost of the wire will become very expensive. A point, therefore, may be made here, that even though the article to be manufactured is highly scientific in its nature, theory, with a certain amount of good horse sense should prevail. In a particular case that came to the writer's attention, it was found advisable to recede a little from theory and change the design of the coil. This was done in order to overcome the wire manufacturer's threat to discontinue supplies because the rejections ate up his small margin of profit, which was based on supplying tremendous quantities of wire. It may be set down then as a fact that only one kind of iron wire is necessary in the manufacture of a core.

The degree of baking should determine its permeability and the number of turns of copper wire in the line winding should determine the amount of inductance to be required in the coil desired for a particular need. It may be well also to point out that unless the iron wire is properly annealed by baking to a temperature of 220 degs. Fahr. when used in certain coils, excessive cross talk will be found in the completed coil in the side to side circuit.

In a phantom coil of four sections, balanced to an inductance of ¼ per cent., it has been proven under certain conditions of design, that if the iron wire core is not properly annealed before the coil is completed, adjusted for cross talk and then baked, it will be found, upon again testing, that an excess of cross talk above the required specification has appeared. Thus in the manufacture of a loading coil, from a cross talk standpoint alone, it is necessary to bake No. 38 B. & S. gage iron wire, having 65 permeability, on the original spools before it is used in the core.

As a matter of theory, the cross section of the iron wire used in a core, is given some weight, a specification of .0038 inch to .0042 inch being maintained. It has, however, been determined from a large number of spools selected at random from stock, that the cross section of the wire as it comes from a reliable manufacturer, cannot be controlled either by the shape, size, or construction of a die. It will be found on the average uniform. Lengths of the wire will frequently be found either in excess or below the limits of the specification, depending upon whether it appears flat, having two distinct sides, or whether it runs circular in form.

The argument is advanced that, even from a theoretical point in regard to hysteresis losses, the cross section of the iron wire is not of great importance. This conclusion is reached not only as a result of the permeability test that follows the cross section test, but also by the amount of wire used in making this test and the wide variation that must be allowed in the permeability test, to meet the demands of the wire manufacturer for a commercial product. It may be stated here that all of the high efficiency coils now installed in the transcontinental line have cores that are made of 65 permeability No. 38 B. & S. gage cellulose insulated iron wire.

Most of the loading coils that have so far been installed are aerial coils. Because of this fact, insulation resistance is a very important factor both from an efficiency and life standpoint. It has been determined that a breakdown test of 8,000 volts alternating current should be specified for all aerial coils. This protection was determined upon as essential, even though material sacrifices had to be made in efficiency and shop cost to meet this specification. In obtaining this high insulation, the fact that cross talk must be kept to a minimum is not forgotten. A unit of cross talk as determined by A. T.

& T. Co. standards is one millionth of the outgoing current.

In this a great contrast is seen between the currents involved, when considering cross talk and insulation resistance. This affords a comparative idea of the broad fields to be covered by a telephone engineer in meeting and overcoming some of the perplexing and difficult problems that come before him in every day practice.

Not only the insulation, but also the impregnation of loading coils is of material value in determining their efficiency. The presence of moisture in any part of a loading coil, is highly objectionable as the effective resistance of the loading coil may be increased by failure to remove it. Vacuum drying of loading coils may therefore be considered of primary importance even although it is true that cross talk in a loading coil is in no way affected by the presence of moisture.

The vacuum drying of loading coils is essential since it permits of a method of insulation, particularly between the core and the winding, which would not be possible if ordinary oven baking were used, even though excessive temperature limits were employed in the latter method. The use, therefore, of the most efficient insulation, namely, five layers of varnished linen between the core and the winding, is possible only when vacuum drying is used. Ordinarily only eight layers of cotton tape are used between the core and the winding in the manufacture of aerial coils, which are subjected to a breakdown test of 8,000 volts alternating current. Properly baked in an oven and treated under vacuum with a suitable oil compound, eight layers of cotton tape would be entirely sufficient for aerial coils.

While it is true that vacuum drying of a loading coil involves the use of more expensive apparatus than is necessary with an ordinary baking oven, it will be apparent, from the following that the difference in this manufacturing cost alone, to say nothing of its technical importance, is more than made up by the advantages gained:

In the ordinary oven baking 72 hours is required, while vacuum drying requires only eight hours.

The baking oven requires a separate operation of the vacuum treating method. Vacuum drying can be so arranged that vacuum treatment may at once follow the drying process without removing the coils from the chamber. Time and labor may therefore be saved by vacuum drying in drying the coils, treating and handling during the assembly in the case.

Resin and resin oil of 45 and 55 per cent., respectively, are the ingredients most suitable for the impregnation of loading coils. A freely flowing compound is necessary. It is of importance that every layer of insulation, crevice and air chamber be thoroughly impregnated. The importance of the proper mixture and its use may be better understood when it is realized that after the coil is impregnated, it would be impossible to correct any error in inductance due to winding, or excessive effective resistance due to winding or overheating, without entirely removing all of the windings. It has been found that in attempting to change any winding or part of one, the compound, during another drying operation, will flow into the new winding, before the moisture has been removed from the new winding.

Dr. Pupin's mathematical formula for the distribution of inductance did not apply to the phantom type of coil. The non-phantom type of aerial coil is not now being manufactured, although some of the old types of coil are still in service in some localities. It is the practice to change the old type of coil to the new phantom type as soon as possible, consistent with the operating conditions. The old non-phantom type of cable coil is still manufactured and an outline of its design may be of some interest.

Non-phantom cable coils are assembled in cases in combinations of 20 to 98 coils per case. Being installed in vaults underground they are, of course, not exposed to lightning or high potential currents. It is not, therefore, necessary to design such coils to withstand high voltage breakdown tests and their size, construction and the methods of treating differ considerably from the coils used for aerial service.

It is the practice to use non-phantom cable coils for the loading of the long trunks found in large cities. Such coils, however, due to their construction and winding, cannot be used for phantom circuits as part of a unit of loading in which a

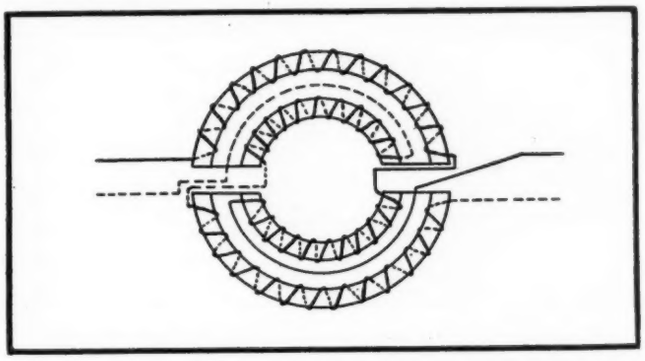


Fig. 2. Section Showing Complete Inner and Outer Windings.

phantom coil is used. It was formerly the practice to use such coils for toll circuits even though the circuits might later be changed over to phantom circuits. It is now the practice, however, in such cases, to install side circuit coils that may later, if desired, be used with phantom coils as a unit of loading for phantom circuits.

In order that these coils may occupy as small space as possible, and that as large a number may be installed in one case as good mechanical construction will permit, it is essential, especially where high inductance is required, to use 95 permeability No. 38 B. & S. gage iron wire for the core. With this grade of wire, an inductance of from .26 henry to .28 henry is obtained with a very small winding of No. 21 and No. 22 B. & S. gage copper wire.

The side circuit phantom coil is wound in two comparatively equal sections with a complete inner and outer winding in each section. The non-phantom type of coil is, however, composed of two sections having only one complete winding on each section of the coil. This coil being subject to only a 500-volt alternating current breakdown test, two or three layers of tape between the windings and the core are necessary, depending, of course, upon the thickness and quality of tape that is used.

Uniformity in winding is desirable in winding any coil and is, of course, particularly desirable in a loading coil. The outside and inside diameter and the axial height dimensions are important factors in determining upon the total number of turns to be applied to obtain a given inductance. While it is the best practice to use automatic toroidal coil winding machines for the purpose, it has been found impossible to obtain good winding construction without a large amount of what might be termed, hand winding.

The core of iron wire is wound upon brass forms which are slotted to provide for tying the core with waxed twine at intervals of one inch. After the core is taken from the form, the tying cords may be removed as the taping of the core proceeds. In this way, the uniformity of the outer and inner periphery of the core is maintained. The core after taping is ready for the winding of the coil. In view of the small space involved, it is necessary that the turns of the winding on the inner periphery of the coil be smooth and uniform and a small layer of muslin is used between the layers of the windings. It is, of course, impossible to maintain this uniformity in the outer periphery. Care, however, is exercised to prevent the tension of the winding wire forcing the turns of one layer down between the turns of the layer below. The coil being wound in two sections, it is necessary to have an inner and outer terminal brought out from each section at opposite sides of the coil, as is shown in Fig. 2.

Aerial and cable side circuit coils are quite similar in construction, the chief difference being in their size. The aerial side circuit coil is larger than the cable side circuit coil because more inductance is required. It also contains heavier insulation to protect it from high potential currents and lightning.

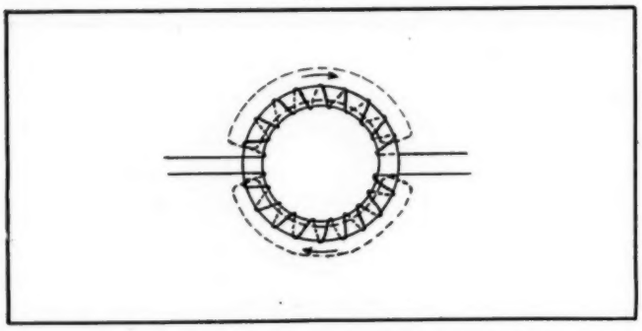


Fig. 3. Path of Magnetic Lines of Force of Coil.

A side circuit phantom coil is divided into two approximately equal sections, each section containing a complete inner and outer winding. As the aerial side circuit coil is subjected to a breakdown test of 8,000 volts alternating current, five layers of varnished linen insulation are required between the windings and the core and between the inner and outer windings. The cable side circuit coil is only required to withstand a breakdown test of a maximum of 1,000 volts alternating current. Therefore five layers of linen tape between windings and between the windings and the core is ample to meet this breakdown test.

Two complete windings being applied to each section of a side circuit coil, eight terminals are obtained. As only two complete windings, consisting of an inner and an outer winding of opposite sections are used, four leads are brought out as representing two line windings. These are shown on coils *S* in Fig. 1.

Eddy current losses in a loading coil were at one time considered to be of primary importance in determining the ultimate efficiency of the coil. In order to reduce these eddy current losses to a minimum amount, it was deemed advisable to use a stranded conductor of seven No. 22 B. & S. gage wires in winding what is now termed the high efficiency type of coil. It was found out later, that a great part of the eddy current losses were due to the proximity of the iron case, especially in the aerial type of coil.

It was also determined that considerable money could be saved in using a solid conductor of No. 16 B. & S. gage copper wire for the windings. Space being very important factor, it was determined to use only a solid conductor in winding a coil of the most improved design. All copper wire, used for winding loading coils, is insulated with what is known as four-pass black enameled copper wire having a double cotton covering. Eddy current losses, being of importance in the design of a loading coil, must be considered in the construction of the loading coil case. In Fig. 3 the magnetic lines of force in the core and their path outside are shown by the dotted lines. It is these lines of force which cause the eddy current losses.

Phantom aerial coils and phantom cable loading coils are similar in construction. They differ, however, in size, due to higher inductance and the use of varnished linen between the windings and the core and between each outer and inner winding. The phantom loading coil is similar in construction to the side circuit phantom coil except that it is divided into approximately four equal sections instead of two. Each section is separated from the adjoining section by means of fibre washers. Eight terminals of four complete line windings (coil *P*, Fig. 1,) are brought out of the aerial loading coil case instead of two line windings of four terminals.

As has been previously stated, it is desirable in the design of a loading coil that the inductance of the windings shall balance to within ¼ per cent. Due to variations in raw material, it is very difficult to obtain this result. Consequently, even though the turns on a winding are very closely checked, it is almost always necessary to add turns to the outer windings to meet the minimum and maximum limits which are specified for direct current resistance and inductance.

This adjusting of the winding adds to the number of turns on the completed outer winding. There has not been found any serious objection to this unavoidable condition in the design of either a side circuit phantom aerial or cable coil. In the case of a phantom coil, it has been found, that a decided objection to the excess turns, exists and, of course, cross talk is again the important factor.

In addition to the above necessity, for adding turns for direct resistance and inductance, it is also necessary to add turns to the outer winding in adjusting a phantom coil for cross talk. While it was found essential to remedy high cross talk to permit of an inductance unbalance of ½ per cent., instead of ¼ per cent., it was also found that the excessive addition of turns to the outer winding of a phantom coil brought about an excessive amount of eddy current losses of the coil. As it is the practice to connect the phantom coil in the talking circuit in such a manner as to cause high eddy current losses its efficiency from an effective resistance standpoint is materially lowered.

As the effective resistance of a loading coil determines the amount of copper wire to be used in the length of a circuit to be loaded, by merely adding a few turns of wire to the outer winding to remedy one important defect (cross talk) another difficulty was encountered. It was of such a troublesome nature as to necessitate the complete re-design of the phantom type of coils. This change in design was so radical, that it was necessary to determine upon the solution of the problem by the only logical method that was left, even to a laboratory physicist. That method was thumb rule. It was advisable to make up a large number of coils, so that by actual hand count, the number of turns on the inner winding for a coil of a specified inductance, could in all cases be pre-determined.

The final result was the opposite in design and contrary to all previous formulae then known to the art. As a matter of fact, there was not a formula nor is there even now, mathematical or otherwise, for determining the desired result. It will probably be surprising then to note here, that at the conclusion of the thumb rule experiments, it was decided to predetermine the turns used on the inner winding of a phantom coil of a given inductance. This decision resulted in a design of winding, opposite from the principles upon which all previous coils of the phantom type had been based, namely, that there were to be more turns in the inner winding than in the outer winding.

It might be also noted that even though a most efficient coil from every other standpoint had been produced, still cross talk is able and has, upset and set aside the most precise formula for the design of loading coils, calculated by the most efficient of mathematicians.

(To be continued.)

District Meeting of the Missouri Telephone Association.

At a district meeting of the Missouri Telephone Association held last week at Macon, Mo., President Houck McHenry and Secretary W. W. Johnson, were present, as well as a large number of the members from that district. Plans for enlarging the district and bringing in new members were adopted.

The needs for closer co-operation of the members were discussed and plans made for bringing about that result. The following committee was appointed to perfect the plans for better organization and increasing the membership: J. H. Wood, of Shelbina, Mo.; C. E. Bloom, of Kahoka; R. E. Gooding, of La Plata, and R. A. Guthrie, of Macon.

"Telephony's" Home Study Course for Telephone Men

A Complete Presentation of the Principles Underlying Modern Telephony in All Its Branches—Arranged Systematically So That Regular Reading and Faithful Study Will Qualify Ambitious Men for Higher Positions—Prepared Under Supervision of Stanley R. Edwards—This Section Written by Jay G. Mitchell

Quiz Questions on the Preceding Installment.

The answer to these questions will be found in the reading section bearing the same number. Answers are not to be sent to TELEPHONY for criticism. For the benefit of those desiring the advantages of a correspondence course, the Engineering Extension Department of the Iowa State College has volunteered to answer questions and criticize replies to questions and solutions of the problems which will be presented from time to time in connection with the course. No charge will be made for this service and the offer applies to all subscribers of TELEPHONY regardless of whether they live in Iowa or elsewhere. Correspondence should be addressed to the Engineering Extension Department, Iowa State College, Ames, Iowa.

84. Why is a core used in the armatures of magneto generators?

85. Why is a five-bar generator better for heavily loaded party lines than a three-bar generator?

86. Why is the current in the secondary of an induction coil always an alternating current?

87. Give an example of sound originating in a vibrating string and transmitted to the air through a sounding board.

88. Give a method of showing the nature of sound waves in air.

89. What principle is common to the acoustic telephone and the electric telephone receiver?

90. When a head receiver is used as a transmitter, what early experiment is being repeated?

CHAPTER VI. The Magneto Set.

91. *The transmitter.* The magneto receiver used by Dr. Bell had been preceded by a similar instrument announced in 1868 by Royal E. House and called by him "The Electro-Phonetic Telegraph." It will be sufficient to note that while House's instrument would have been practically as satisfactory as the one invented by Dr. Bell, he seems to have overlooked entirely its possibilities as a telephone. Another early development which seems to lead directly to the present transmitter is the alternate make and break transmitter of Philip Reis. Before outlining his idea, let us go back and follow the progress made by others in the effort to increase the volume of transmission obtained by Dr. Bell.

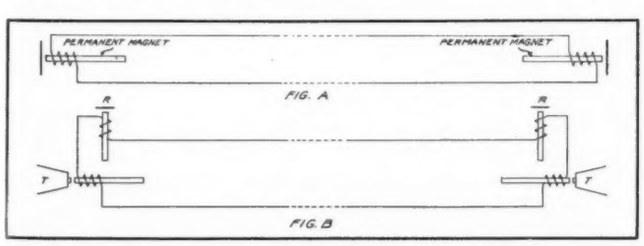


Fig. 31. Bell's Circuit.

The telegraph had reached quite an extensive development at this time and the thought of the inventors seems to have been to make use of the telegraph circuits and telegraph methods for commercial telephone transmission as well as for their experiments. When Dr. Bell traveled about lecturing on his invention and demonstrating its operation, he was under the necessity of engaging telegraph lines for his experiments. He found that the telegraph operators would occasionally cut their telegraph relays in his circuit in order to hear the conversation. It is an interesting fact, not commonly known, that under proper adjustment a telegraph relay will reproduce the sound waves of speech when influenced by telephonic voice currents. The conventional ideas of the telegraph circuit came as a natural heritage to the telephone inventors. Therefore a battery was included in practically all the earlier experimental arrangements, except that used by Dr. Bell.

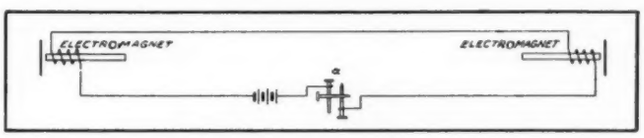


Fig. 32. Hughes' Microphone.

Philip Reis invented a make and break transmitter. His idea was to permit the diaphragm of the transmitter to *make and break* the current flowing in the circuit as it vibrated to and fro. Owing to the actual interruption of the circuit, he was unable to transmit the finer quality of spoken sounds, although it is believed that he was able to transmit musical sounds having a regular frequency. His receiver was also designed on an inefficient principle and was not a success. Emil Berliner approached a solution of the problem in another and more successful way. He caused the vibrations of the diaphragm to vary the *area* of contact between two metallic bodies. As the resistance of the *contact* is dependent upon the *area* of the surfaces joined, Berliner achieved some very notable results. Professor Elisha Gray varied the resistance of the circuit according to the vibrations of the diaphragm by varying thereby the length of a part of the circuit led through water.

David Hughes found that two bodies in *imperfect* electrical contact would vary the intimacy of the contact when under the influence of vibrations due to sound waves. The principle of Hughes' discovery is illustrated in Fig. 32. This is one form of Hughes' microphone. Such an arrangement, under proper conditions, is said to transmit speech. With a receiver and

battery it greatly magnifies small sounds such as that of a ticking watch. A more familiar form of this device consisted of a rod of carbon pointed at both ends and supported from the pointed ends by recessed blocks of carbon, in the recesses of which the ends of the pointed rod were placed. The circuit

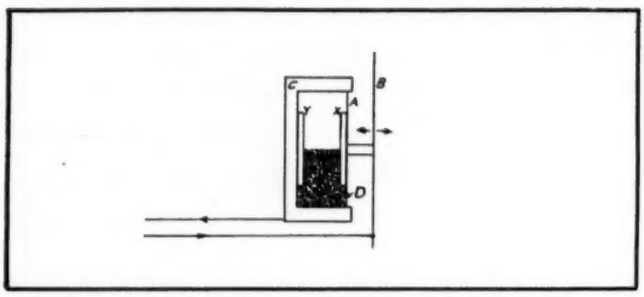


Fig. 33. Theory of Solid Back Transmitter.

was then led from one recessed carbon block to the other through the pointed rod and its points of contact. Thomas A. Edison discovered that carbon exhibits a variable electrical resistance under variable mechanical pressure.

92. *Underlying principles of the standard type of transmitter.* These are the principles underlying the successful and efficient transmitter as it has practically been standardized. It will be best to fix these principles in mind. They are:

The variation of the resistance of the circuit by a variation in the *area* of contact between two terminals.—Berliner.

The variation of the resistance of the circuit by a variation of the *intimacy* of contact between two terminals.—Hughes.

The variation of the resistance of the circuit by the variation of mechanical *pressure* on carbon in it.—Edison.

93. *Operation of modern transmitter.* The modern transmitter is represented in principle in Fig. 33. The diaphragm *B*, when thrown into vibration by sound waves, crowds the carbon granules *D* more closely together. The area of contact between each granule and its neighbors is thereby varied, affecting the total resistance from *B* through the granules to the containing cell *C*. This is the principle of Berliner.

As the diaphragm *B* vibrates under the effect of sound waves, it varies the intimacy of contact, or the quality of contact between each carbon granule and its neighbors. The total resistance of the transmitter from *B* to *C* is thus varied. This is the principle of Hughes.

The vibrations of the diaphragm *B* vary the mechanical pressure on the carbon of the granules and the electrodes *X* and *Y*, thereby varying the resistance of each. This is the principle discovered by Edison. Inasmuch as all these effects are in accord, it is doubtless due to their aggregate effect that the transmitter produces variable voice currents similar in character to the sound waves striking its diaphragm.

In the illustration, Fig. 33, the diaphragm *A* is made from mica and supports a highly polished carbon disk electrode *X*. An exactly similar disk, *Y*, is rigidly supported by the containing chamber *C*. The mica diaphragm *A* is flexible to permit of the movement of the carbon electrode *X* to and fro in unison with the main diaphragm *B*, which is usually made from aluminum. The circuit is led from the main diaphragm *B* to the containing chamber, *C*, through the electrodes *X* and *Y* and the carbon granules *D*. It is not essential that the electrodes *X* and *Y* be of carbon. They have been made successfully of metal plated with platinum. They must, however, be smooth and polished. Otherwise the carbon granules will wedge and the transmitter will "pack" more often than otherwise.

We have seen in Sec. 86, TELEPHONY, April 10, that if the current flowing in the primary of an induction coil varies in strength, a current will always be produced in the secondary winding while the current in the primary is changing. This is due, it will be remembered, to the resulting change in the magnetic flux produced. Now if the current becomes first stronger, then weaker in succession and in regular or irregular periods of time, an alternating current will flow in the secondary if its circuit is complete. Since this is one of the electrical effects on which the operation of the transmitter depends, it is well to consider briefly the causes that regulate the strength of the current flowing in *any* electrical circuit.

94. *Resistance.* Suppose we should connect the ends of a piece of No. 10 B. & S. gage copper wire, 1,000 feet in length, to the terminals of a source of electrical energy of large capacity such as a very large lighting dynamo. If the dynamo is in operation and delivering current at a pressure or voltage of 110, the strength of the current flow in the wire would clearly be fixed and definite. Now suppose that the ends of a second exactly similar piece of wire should also be connected to the same dynamo terminals. It is clear that if the second wire is of the same length and size as the first that exactly twice as much current can be carried by the two wires together as was carried by the first one alone. This is because there are two paths for the current instead of one. The *resistance* or opposition of the combination would therefore be reduced one-half.

If the two wires should be removed and taken to the mills to be melted and re-drawn into one larger wire 1,000 feet in length, the larger sized wire obtained might be connected to the dynamo terminals. It would then carry as much current as the two smaller wires from which it had been made. If the large wire were cut at right angles and the area of the end measured, we should find that it would have twice the number of square inches of area that each of the original No. 10 wires had. The resistance of 1,000 feet of No. 10 B. & S. copper wire is practically one ohm. The joint resistance of two No. 10 B. & S. copper wires, side by side, is therefore practically one-half ohm if they are each 1,000 feet in length.

Ohms*		Length Ft.	Area
½	One No. 10 B. & S. Wire.....	500	1
½	Two No. 10 B. & S. Wires side by side	1,000	2
1	One No. 10 B. & S. Wire.....	1,000	1
1	Two No. 10 B. & S. Wires side by side	2,000	2

*Approximate

Table Showing Variation of Resistance With Length and Area.

It is clear, therefore, that the resistance of a copper wire having twice the sectional area of No. 10 (two No. 10 wires redrawn into one larger wire) is one-half the resistance of the No. 10 wire.

Suppose the original No. 10 wire cut into two pieces, each

500 feet in length: Each 500-foot length would have one-half the resistance of a piece of the same size wire 1,000 feet in length. These results are shown in the accompanying table of resistances. A little study of this table will show that the resistances of any two copper wires change in exact proportion to their length divided by their sectional area. Any number of cases might be added to the table without disclosing any variation from this law. In general this law is true of any conductor. The resistance increases in direct proportion to the length, and decreases in direct proportion to the increase in sectional area. If the sectional area decreases, the resistance increases proportionately.

Volts	Amperes	Ohms
55	55	1
110	110	1
110	220	½
220	220	1

Table of Voltage Relations.

95. *Current.* With a piece of copper wire of No. 10 B. & S. gage connected to the terminals of a dynamo delivering current at a pressure of 110 volts, there would be a current flow of 110 amperes provided the wire were 1,000 feet in length. Each volt of pressure would produce a current flow of one ampere in this or any other conductor having a resistance of one ohm. With the two No. 10 wires, side by side, the same dynamo would produce a current flow of 220 amperes in the two together, provided their length were the same as before. If there were only one No. 10 copper wire, 500 feet in length connected to the dynamo terminal, a current of 220 amperes would flow as the *length* of the wire is one-half of the original number of feet. Therefore the path for the current offers only one-half as much *resistance*. It is clear that the current in any wire for any voltage increases in exact proportion as its *resistance* decreases. It should be thoroughly understood that while the resistance of 1,000 feet of No. 10 B. & S. gage copper wire is *practically* one ohm, it is not exactly so. In general, it is accurate enough for most purposes to consider this true. It is also well to know, speaking practically, that in the Brown and Sharp copper wire gage table, each wire has one-half the resistance per foot of the wire having the third higher number. For instance No. 10 has one-half the resistance per foot of No. 13, No. 7 of No. 10 and so on.

96. *Voltage.* If, in the first case, we had connected the No. 10 copper wire 1,000 feet in length to the terminals of a dynamo delivering current at a pressure of 220 volts instead of 110 volts, the *resistance* of the wire would have remained as before, but, inasmuch as the pressure or voltage would be twice as high, the current strength would also be doubled. With a piece of No. 10 copper wire 1,000 feet in length, the current strength would have been 220 amperes. If on the other hand the dynamo voltage had been 55, we should have found that only 55 amperes would flow in the wire. These conditions are shown in the accompanying table of voltages and a little careful consideration will render the law governing the voltage in any electrical circuit, clear. This law is known as Ohm's Law and its importance cannot be overstated.

97. *Ohm's Law.* The table shows that if we multiply the number of amperes in a circuit by the number of ohms in the same circuit, the product will be the number of volts in the same circuit. Any number of specific cases might be added to this table and it would be found that this always holds true. In general we can write:

$$\text{Volts} = \text{amperes} \times \text{ohms} \quad \ldots\ldots (3)$$

Suppose we increase the ohms in any circuit. From the formula, the volts will increase. Likewise if we increase the amperes in any circuit, the volts will increase. If we should divide the number of volts by the number of ohms (remembering that the two numbers in formula (3) are of equal value), the number of ohms would cancel out of the right hand term. We should then have Ohm's Law as it is usually written:

$$\frac{\text{Volts}}{\text{Ohms}} = \frac{\text{Amperes} \times \cancel{\text{Ohms}}}{\cancel{\text{Ohms}}} \text{ or } \frac{\text{Volts}}{\text{Ohms}} = \text{Amperes} \quad \ldots\ldots (4)$$

In other words the number of amperes in any circuit is obtained by dividing the number of volts by the number of ohms.

(To be continued.)

Annual Report of Santa Monica (Cal.) Home Company.

The gross earnings of the Santa Monica Bay Home Telephone Co., of Santa Monica, Cal., for the year ending December 31, 1914, were $47,865. This includes $45,137 for rentals and $2,728 for toll and long distance receipts. The total expenses were $40,040, which includes $9,193 maintenance expense, $5,692 traffic and commercial expense, $5,272 general and miscellaneous expense and $19,883 for fixed charges. Included in the fixed charges is a reserve of $4,334 for depreciation. This left a net surplus of $7,825, for the year.

The statement of assets and liabilities of the company, of December 31, 1914, follows:

ASSETS.

Cash on hand		$ 609
Plant investment		259,838
Treasury stock		31,500
Stock discount		139,920
Bond discount		17,200
Automobiles and cycles		325
Accounts and bills receivable		2,527
		$451,919

LIABILITIES.

Bonds of Home Telephone & Telegraph Co. of Santa Monica and Ocean Park	$150,000	
Bonds of Santa Monica Bay	35,500	
Home Telephone Co.		$185,5( )
Sinking fund redemption of bonds		600
Bills payable		12,253
U. S. Long Distance Co.	$ 1,461	
U. S. Long Distance booths	10	1,471
Subscribers' deposits		1,619
Tax reserve	$ 1,132	
Insurance reserve	91	
Sundry interest reserve	248	
		1,471
Bond interest reserve		4,070
Audited accounts payable		1,906
Reserve for depreciation to January 1, 1915		23,483
Capital stock, preferred	$250,000	
Less unissued	43,000	
		207,000
Capital stock, common	250,000	
Unissued	250,000	
Surplus		12,546
		$451,919

Telephone Transmission in Its Relation to High Tension

The Private Telephone Lines of Power Companies in Close Proximity to High Tension Leads—The Insulating Transformer and Fuses—Use of Drainage Coils—Paper Presented Before Southeastern Section, National Electric Light Association

By E. S. Moorer

The question of the effect of high tension power transmission circuits on neighboring telephone circuits is one that is naturally divided into two parts:

1. The effect on circuits at some distance from the disturbing source, in which case the induced currents, though very small, are still sufficient to interfere with speech transmission. 2. The effect on telephone circuits in close proximity to the power lines.

In the first of these cases the conditions are so complex and varied as to practically preclude any general statements as to the effects or the remedies, which should be applied. The second case covers the private lines of power companies. These lines are usually carried very close to the transmission lines, and it is to such conditions as these, that this paper has been confined.

From the outset it must be borne in mind that even when equipped with the best devices available, telephone lines, carried very close to high tension transmission lines, are a source of danger to the users. The element of danger is such that it could not be countenanced in connection with the commercial telephone lines. In the case of private lines, however, it has often been found necessary by the power companies to run the telephone lines in the exposed region in spite of the accompanying hazard.

From a first cost standpoint it is, of course, advantageous to run the telephone lines on the same poles or towers as the transmission line. Aside from the question of cost, it is usually difficult to obtain a separate right of way for the telephone line. Further, for patrol work, it is necessary that the telephone line be located conveniently to the transmission line in order that the patrolman may quickly report any trouble which he may find on the line. For these reasons it has become quite common to employ telephone lines carried on the same poles as the transmission lines, and to equip these lines with such devices as will render them reasonably safe and still allow a grade of speech transmission satisfactory for private line use. As an additional safeguard, it is the usual custom to consider these telephone lines at all times as dangerous high tension lines.

Taking up the question of telephone lines exposed to high potential power lines, there are two general questions to be considered, as follows:

1. The potential which will be found on the telephone line.

2. The means which are taken to counteract the effect of this potential and render the line usable.

Sources of High Potential on Lines.

There are two general sources of potential on lines of this character, one of which—actual physical contact between the wires—is an accidental condition and therefore relatively infrequent. The second source, induction, is one which is continually present. Induced potential is the result of two different phenomena, electromagnetic and electrostatic induction. It is possible that both of these effects may be found in a single circuit, but it will usually be found that one of the effects will predominate.

In case there are several disturbing wires in which the currents are not in phase, the induced voltages from this source may be partially neutralized.

The induced voltage in a telephone line will depend upon the load and the frequency of the power line, upon the length of exposure, in the case of electromagnetic induction, and upon the voltage of the power line in the case of electrostatic induction.

Circuits Troublesome to Telephone Lines.

Practically all transmission systems are three phase. There is, however, one other type of circuit that is especially troublesome to associated telephone circuits. This is the single phase alternating current railway. Trolley voltages up to 11,000 volts are in use and, since the return is through the track and ground, there is much smaller neutralization of the inductive effects. When the trolley voltage is high, the induced voltage may be electrostatic, but it has been found that in most cases the greater trouble has been experienced from electromagnetic induction. The induced voltage depends to a large extent on the amount of current which leaves the track and returns through the earth. This depends on the method of distribution employed in supplying current to trains. The question of operation of telephone circuits close to single phase railway circuits is largely dependent on the local conditions for each installation so as to practically preclude the possibility of any general statements.

In the case of three phase circuits, there are in reality three separate sources of power of the same voltage and frequency, but differing in phase 120 degrees. These three sources of power are three windings on one generator. When these windings are connected to a three-wire line, the algebraic sum of the voltages between the wires is zero, owing to the difference in phase.

The generator voltage rarely exceeds 13,000 volts, step-up transformers being used to obtain the higher voltages. At the distributing end, step-down transformers are used to obtain the voltage required by the load. The transformers may be either delta or star connected. In the latter case, the neutral point of the windings may or may not be grounded. If the neutral is grounded, this may be done directly or through a resistance.

Inasmuch as, assuming a balanced load, the algebraic sum of the three phase currents and voltages is zero, induction in adjacent circuits under this condition could be practically eliminated by placing the phase wires close together and making this distance between the phase wires small as compared with the distance from the telephone circuits. But even this condition does not eliminate inductive effects if the load is unbalanced. The high voltage of the phase wires, however, requires a large separation and the location of the telephone line is often dependent upon its position with respect to the earth as well as with respect to the power wires. The result is that the inductive efforts will be only partially neutralized and that an electromotive force will be induced on the telephone line.

Another feature entering the consideration of the neutralization of inductive effects is the relative position of the power wires with respect to each other. There are three general types of construction employed by which the phase wires are located in a vertical plane, triangularly, or in a horizontal plane. Inasmuch as the telephone line is almost always placed below the power line, it will be seen that the greatest inductive effects will be experienced when the

phase wires are spaced vertically since in this position the neutralizing effects will be the least. In nearly all of the very high voltage systems, the power wires are spaced vertically or approximately so.

The voltage waves from generators and transformers are usually distorted and do not vary uniformly according to the sine law. The distorted waves contain old harmonics of the fundamental, the third and fifth harmonics usually predominating, although higher harmonics may be encountered. These harmonics often cause high voltage peaks and these cause higher static effects in neighboring lines. Also since the harmonics are of higher frequency, both the magnetic and static effects in neighboring lines will be increased.

In a three phase system, the three line currents are one-third of a cycle apart. The third harmonics have three times the frequency of the line current and are therefore in phase. These harmonics exist in the voltage between each wire and the neutral. In a star-connected system, the three line wires act as a single phase circuit having a potential to the neutral equal to the voltage of the third harmonic. This is frequently the cause of static disturbances. When the neutrals are grounded, there is produced a triple frequency current over the three wires with a ground return. Under this condition, the electromagnetic induction in paralleling telephone lines is likely to be large.

Having considered the effects on neighboring telephone lines of high tension transmission lines, there will be taken up the consideration of the telephone lines themselves. There are two general types of telephone lines, one having a single line wire and using the ground as a return, and the other using a full metallic circuit. Inasmuch as the telephone line carried on the same poles as a power line is, through induction, at a considerable potential above the earth, the grounded telephone circuit is obviously out of the question since current would flow continuously through the instrument to ground, making the line useless for speech transmission. In the case of a metallic line, the telephone wires will also be at a potential above the earth. However, if this potential is the same in each wire so that there is little or no current flow through the bridged apparatus, the transmission qualities of the line will not be seriously affected, at least directly. When apparatus is installed to take care of these potentials to ground, it will bring in substantial transmission losses.

In private telephone lines exposed to high potentials, it is the usual practice to insert between the line and the telephone instrument, an insulating member which is intended to prevent conducting the high voltage to the instruments. In conjunction with this arrangement, there are sometimes employed means for reducing the normal line voltage. Because of the fact that the telephone line is continually at a high voltage, it will be readily seen that insulation of the line is of prime importance. Any leak to ground from one of the line wires will result in a flow of current from the opposite side of the line through the bridged apparatus, thus rendering the line inoperative. The practice is to employ on the telephone line high tension insulators having a dielectric strength much above the normal voltage on the line. Special care is taken in all other respects as regards line construction in order to eliminate as far as possible the chance for accidental contact between telephone and power circuits.

The Insulating Transformer and Its Purpose.

At each point on the telephone line where an instrument is located, there is inserted between the line and the instrument a one to one transformer having a very high dielectric strength between windings. This serves to insulate the instrument from the high voltage line. At the same time it permits the voice and signaling currents to pass over the line with, however, substantial losses in the telephone transmission. This transformer is generally placed in the drop wires and is mounted on a pole carrying the lead from the main line to the building. By this means only the wires connected to the secondary, or low tension side of the transformer, are brought into the building.

The transformer is protected against extreme line conditions by means of spark gap arresters and fuses. The arrester has a discharge voltage above the normal line voltage, but sufficiently low to discharge on a voltage which would injure the transformer. Inserted between the arrester and the line are fuses of a comparatively high capacity, but which operate and open the drop wires in case of the flow of a current sufficient to injure the drop wires or arrester. Between the arrester and the transformer are inserted other fuses of lower capacity which open in the event of the passage of a current injurious to the transformer windings.

On the secondary or low tension side of the transformer is placed another arrester of comparatively low discharge voltage. This is intended to take care of induced voltages on the secondary side of the transformer which would result from an unbalance on the primary side. On the secondary side of the transformer, it is customary to place a switch by means of which the telephone set is normally disconnected, leaving, however, the ringer connected in order that signals may be received.

Inside of the switch is located the telephone set and another protector having a still lower discharge voltage. The telephone set usually used consists of an ordinary magneto set having, however, all of the exposed metal parts grounded or insulated from the parts within the set. As a still further precaution, most of the power companies provide a highly insulated platform upon which it is necessary to stand when using the telephone set.

Utility of Telephone Line to Patrolman.

One of the most important uses of these telephone lines is that of enabling the patrolman to quickly report any trouble which he may encounter in his trips over the high tension line. For this purpose telephone sets are located at frequent intervals along the line. The large number of these sets would cause a prohibitive load on the line provided they were all left permanently connected. To obviate this condition, at patrol stations a switch is placed on the line side of the transformer, but inside of the arrester. By this means the transformer is normally disconnected from the line. This arrangement, however, introduces an added element of danger in that it is necessary to handle by means of a switch stick, the switch which is connected to the exposed part of the line.

For patrol work the telephone set is often the outdoor type magneto set, having the case and metal parts grounded. Some of the larger companies, however, prefer to install small booths usually within the bases of the towers, and to equip these booths with sets similar to those used at permanent stations. Where such booths are used, it is customary to install high voltage disconnecting switches operated from inside the booth. The use of portable sets and means whereby connection to the line can be made at any point is, of course, extremely dangerous and is very rarely attempted.

One of the most important points in connection with lines of this character is that of transpositions. In any length of exposure one conductor will have induced on it a higher voltage than the other, unless steps, which are commercially impossible, are taken to locate the telephone line in exact balance with respect to the power line. With one conductor at an appreciably higher voltage the line would, of course, be noisy. To eliminate this condition, the telephone line is transposed at frequent intervals and the unbalancing inductive effects are neutralized.

It is also important that the power line be transposed at

intervals in order that the telephone line may not be exposed continuously to the inductive effect of one phase. It is necessary, however, that the respective transpositions in the telephone and power lines be so located with respect to each other that the effect of transpositions will not be nullified. The transpositions of a telephone line will not, of course, reduce the voltage between the line and ground. The transposition of a power line tends to reduce the voltage between the telephone line and ground. The amount of this reduction is difficult to forecast with any degree of accuracy, in a specific case.

At times there are installed devices intended to reduce the induced voltage of highly exposed telephone line. Such devices consist of some means of draining the induced current to earth. They are objectionable in that they are likely to give the users of the line a sense of security which might be fatal in case of the accidental destruction of the drainage device. The necessity for drainage is usually indicative of poor line construction or of insufficient transpositions in the power circuit. It is usually found more satisfactory to reduce induced potentials by remedying these conditions.

The common form of drainage consists of a coil having two balanced windings so connected to the line that they are inductively in series across the line, but non-inductively in parallel to earth. This readily allows the flow of induced current to earth, but opposes the passage of current between the two sides of the line, thus reducing the shunt to talking and signaling currents. Another drainage method, which has been proposed, consists in surrounding the telephone line with grounded metallic conductors which tends to shield the line from static effects. The cost of this method is such, however, as to make its use prohibitive on long lines. A similar effect would be obtained by running the telephone conductors in a cable, but the usual long length of such lines would prohibit this method from a transmission standpoint, even were it permissible from the standpoint of cost.

In conclusion, it can be stated that a large number of private telephone lines carried on the same poles as, or closely adjacent to power lines, are in operation. They are, of course, subject to interruptions, these interruptions coming in some cases when the line is most needed. Grounds on the transmission line cause a large increase in the induced voltage and noise on the telephone line. Surges due to switching operations, charging of electrolytic arresters, etc., cause corresponding surges on the telephone line. The effects of such surges may be only momentary, provided the proper form of arresters is used.

To take care of emergencies, many of the large power companies have arrangements with the local telephone companies over whose lines roundabout connections can be obtained between certain important points on the power line. In spite of their limitations, private telephone lines are considered indispensable by most of the operating power companies. As to the drawing of any conclusions which can be applied to any case, that is impossible. The peculiar conditions of each specific installation require that it be handled as a case apart. Even when equipped in the best manner known, such lines are dangerous and cannot be considered in the same light as ordinary telephone practice.

Meeting of Southeastern Association of Minnesota.

A large number of Independent telephone companies were represented at the annual meeting of the Southeastern Telephone Association, held recently at the Zumbro Hotel, Rochester, Minn.

Existing local conditions were discussed at the morning session, after which the following officers and directors were elected for the ensuing year: James P. Keane, of Pine Island, president; J. A. Malone, of Rochester, vice-president; H. E. Wirt, of Lewiston, secretary and treasurer; J. R. Springsted, of Dodge Center; M. N. Reiland, of Rollingstone, E. Gardinier, of Claremont, James A. Carley, of Plainview, and W. T. Schmidt, of Eyota, directors.

At the afternoon session J. H. Shoemaker, of St. Paul, gave a very interesting and instructive discourse on the effects of the public utilities bill then before the legislature, upon the Independent companies of the state. He pointed out clearly to those present the benefits of commission regulation.

In connection with the managers' meeting, a school for the operators was conducted by Miss K. M. Gang, of Bloomington, Ill., which was well attended by operators from surrounding exchanges. These schools, conducted by one so efficient in operators' needs as Miss Gang, are meeting with great favor, as they tend to create a more congenial sentiment among the operators in addition to making them more efficient in their work.

Joint Convention of Pennsylvania Independents.

At the joint convention of the Eastern and Western Pennsylvania Independent telephone associations, held last week, April 7 and 8, in the Cumberland Telephone Building, Harrisburg, Pa., there were about 200 in attendance. In addition to those attending the convention, over 100 operators attended the operators' school held in the Y. W. C. A. Building, under the direction of W. S. Vivian, of Chicago, secretary of the Independent Telephone Association of America.

The opening address was made by Governor Brumbaugh, who discussed efficiency and economy. Among the other speakers were Henry M. Tracy, of Philadelphia, president of the Eastern association; E. B. Fisher, of Grand Rapids, president of the Independent Telephone Association of America; W. H. Hay, of Pittsburgh, service engineer of the Western association; Richard Hawkey, of Pittsburgh, general manager of the Pittsburgh & Allegheny Telephone Co.; and E. D. Schade, of Johnstown, general manager of the Johnstown Telephone Co.

Telephone Men in Attendance at the Ninth Annual Convention of the North Dakota Telephone

The Eastern Independent Telephone Association elected the following officers for the ensuing year: President, C. A. Carl, Harrisburg; first vice-president, Geo. R. Rudy, York; secretary-treasurer, O. K. Kines, Harrisburg; and chairman of executive committee, E. M. Prisk, Hazleton.

On the evening of April 7 a banquet was held at the Harrisburg Club. Music was furnished by the Keystone Quartet and Melvin Smith, pianist.

Operators' School to be Held in Carthage, Ill.

The Mississippi Valley Telephone Co. has arranged for an operators' school to be held in Carthage on April 20 and 21. It will be in charge of W. S. Vivian, of Chicago, secretary of the Independent Telephone Association of America. It is expected that the operators from all the other exchanges in the county will be present, the chief operators attending on both days and as many of the other operators as possible each day.

The object of these schools, which are being conducted throughout the entire state, is for the purpose of bringing about uniform operating by having uniform language for the operators and in every way possible fitting the operator for the better performance of her duty.

San Francisco Convention of Independent Association.

The Independent Telephone Association of America is sending out a letter and an eight-page folder giving detailed information regarding the convention to be held at Hotel Plaza, San Francisco, Cal., during the week of October 25, of this year.

By holding the convention in San Francisco the directors believe the association will be able to be of considerable assistance to the Independent companies of the Pacific Coast. Furthermore, it was learned that a number of telephone men with their families and friends were planning to visit the Panama-Pacific International Exposition some time during the year. The convention will thus combine both business and pleasure and enable the telephone men of the East and the Middle West to become better acquainted with the telephone men of the West.

To obtain the most comfortable and desirable accommodations possible, special trains will leave Chicago on Thursday evening, October 21 (exact time to be announced later), via the Rock Island Lines to Colorado Springs. At this point a stop will be made giving sufficient time to enable members of the party to take in the various points of interest, including Pikes Peak and Crystal Park, leaving Colorado Springs via the D. & R. G., at a time that will enable them to go through the Grand Canyon and Royal Gorge by daylight, arriving at Salt Lake City about noon.

At Salt Lake City the members will be given a sight seeing automobile trip throughout the city, leaving in time to pass through Feather River Canyon in daylight, which will give the party an opportunity of viewing the most beautiful scenery west of the Rocky Mountains.

The party will arrive in San Francisco on Monday afternoon, October 25, where automobiles will meet them and take them to the Hotel Plaza. Here they will find their rooms already assigned and will be handed their keys and find their respective baggage in their rooms—ready for a week devoted to business and pleasure.

The tour will be under the direction of The Gregory Tours, Lytton Building, Chicago, and St. Louis, Mo., officially appointed tour agents for the Panama-Pacific International Exposition. The party will be personally conducted—a competent man will be in charge, relieving everyone of travel worries. The party will go via the route previously described and may return by any other Central or Southern route. Persons desiring to do so, may stop en route at the principal points of interest on the return trip. The reservation may be transferred to any person acceptable to the representative of The Gregory Tours, at any time prior to 30 days before the date of departure.

Owing to the vast number of people who will attend the exposition, as evidenced by the unusually large attendance that has already commenced to move, the association urges that reservations be made at once. The Plaza Hotel has about 75 per cent. of its rooms with bath and the management of The Gregory Tours has waived its original extra charge for rooms with private bath, therefore those who make their reservations first will be assigned to the rooms having private bath.

The total expense of the trip from Chicago will amount to $154. This will include a first-class railroad ticket to San Francisco and return good for 90 days; Pullman sleeper to San Francisco and return; automobile transfer of member and checked baggage to and from hotel at San Francisco; seven consecutive days at hotel in San Francisco (two in double room) including breakfast; seven admissions to the exposition; admission to 20 attractions within the exposition grounds; transportation to Los Angeles and San Diego. Returning via the Northern route will cost $17.50 extra.

Reservations are to be sent to W. S. Vivian, secretary of the Independent Telephone Association of America, 19 So. La Salle street, Chicago, accompanied by a first payment of $10. An additional payment of $10 must be paid within 30 days after making the reservation but the balance need not be sent until October 1. All checks are to be made payable to The Gregory Tours, Lytton Building, Chicago.

The cost of the trip is based on the railroad and Pullman reservation rates from Chicago and the pro rata difference, whether from East or West of Chicago, will be more or less in accordance with difference between these rates. If a party of 25 should signify its intention of going, the Gregory Tours will arrange for a special Pullman from that point to join the special train from Chicago en route.

A special program is being arranged, announcement of which will be made at a later date.

hich Was Held In the Commercial Club Rooms, Grand Forks, N. D., on March 24 and 25, 1915.

Fundamental Principles of the Telephone Business

A Reading Course Designed to Present Logically the Principles Which Underlie Successful Organization and Operation of Telephone Properties —Prepared Under the General Supervision of Stanley R. Edwards—This Section on Economics of Telephony written by James H. Shoemaker

Quiz Questions on the Preceding Installment.

25. What class of men have a self-interest which should cause them to lead in the creation of a justice-loving and a justice-seeking public?

26. What evidence is presented in support of the statement that the public is a myth?

27. In discussing mismanagement, what queries may be made regarding unjust public and private expenditures? What may be a partial defense as to why no steps are taken to inquire into unjust public expenditures?

28. Why is it easier to arouse the people, as a whole, by pointing to an economic waste of a thousand dollars a day through the treasury of the New Haven than by pointing to the waste of a million a day through national, state and municipal treasuries? What motive will probably compel men to carry on the work of cultivating or up-building the justice-seeking spirit?

29. What class of men have the greatest self-interest in the up-building of a justice-loving sentiment and why?

30. What illustrations can you give of the unreasonableness of referring rate reductions to a regulative commission for final decision while advocating that rate raises should be voted upon by the self-interested buyers of the service?

31. What is the worst thing connected with this erroneous notion of referring rate raises to the self-interested buyers?

CHAPTER III. Ownership and Operation.

32. *The Economists' Difficulty.*—Economics includes all business interests. "Nearly all the important problems with which politics deals are economic, and economics is merely the science of business in the largest sense," says one of the most popular of the editorial writers of our time.

In a recently published book, a world-famed economist says: "Our American institutions of learning are now offering 30 or 40 special or separate courses in political economy. . . . . The division of the field has occasioned trouble, especially as the subjects are so closely interwoven. The treatment of property presupposes contract, and contract presupposes property; and vested rights, as they are developed, are based on both."

33. *Ownership the Center of Economic Interest.*—In the midst of this perplexity, one great fact may be plainly seen: Ownership is the central idea of every department of economic investigation. In political economy, everything rests upon and revolves around ownership just as a top rests upon and spins around its balancing point. Human conduct has been, and still is, based so largely upon personal interest (self-interest) that ownership, or the right of property, is the one great central fact. Ownership or the right of property is the great central fact which must be dealt with in every department of economic interest and investigation.

34. *What Telephone Men Want.*—In reality what we need is often more important than what we want, but what we want seems, in some cases, to be more interesting and more immediately desirable. Telephone men feel the need of means for making extensions and improvements. Therefore, they are naturally eager to get all the help from all possible sources, with regard to such matters as rates, rate regulation, monopoly, competition, utility commissions and all kindred subjects. They are in a hurry to find out what, if any, real and immediate help economics can offer concerning these supposedly "more practical" matters. But every one of the interests named, leads more or less directly to the agreement, contract or practice which is at present in operation between the utility and its patron.

As time passes this agreement, contract or practice is seen to be related more and more to the amount of the valuation on which the utility is allowed to earn a reasonable return. Within the recollection of the author, all utilities were treated by law the same as other private undertakings. They were allowed to charge all they could get. Then came the much-quoted decision of the United States Supreme Court in the case of Munn against Illinois (94 U. S., 113) declaring it unlawful for a utility to conduct its business according to the general practice; unlawful for utilities to do as is done in other lines of business; unlawful for utilities to charge all they could get.

This Munn case decision set up for utilities, but not for "private" undertakings, the ideal of "reasonable rates." Value of property, the right to own property or ownership is one of the important elements for consideration in determining the reasonableness of a utility rate.

35. *What Telephone Men Need.*—When we endeavor to find out and present that which telephone men need, we discover that it is not always exactly the thing they want. Some utility managers may look upon political economy now much the same as certain economists, themselves, looked upon it a century ago.

It is the province of speculative philosophy to trace the origin of the right of property (or ownership); of legislation to regulate its transfer; and of political economy to devise the surest means of protecting that right.

Political economy recognizes the right of property solely as the most powerful of all encouragements to the production of wealth, without inquiring about its origin or its safeguards. —Jean Baptiste Say (1767-1832).

But we must remember that a full hundred years and more have passed since Economist Say lived, studied and taught.

In the meantime, and more especially in the last half century, economists have been forced to inquire about the origin and the safeguards of ownership (the right of property). Yet the fact remains that human nature is much the same as in the days of Economist Say. Human nature is such that, as telephone men, we are apt to be more interested in other matters than in the origin and the safeguards of the ownership of our own properties.

Experience is causing an ever increasing number to see the need of inquiring into the origin and safeguards of ownership. "No matter what the political or commercial or practical requirements may be . . . . economic laws cannot be ignored," says President Vail, of the A. T. & T. Co., in the 1914 annual report. It is not the duty of the legislator to put into law whatever happens to strike his fancy as being a pretty good thing. It is his duty faithfully to register the customs and mature conclusions of the people whom he serves, so that each successive step in legislative development may be but a record of the growth and development of our life.

36. *Stagnation is Not Standardization.*—We have been advised in well chosen words, recently, that "standardization does not represent a standing still," so far as the equipment and the practices of a great telephone system are concerned. On the contrary, "standardization means unceasing effort, continual improving and upbuilding." We have tried to show the following facts: Political economy is of great interest to every utility manager. "No matter what the political of commercial or practical requirements may be . . . . economic laws cannot be ignored." The interest of the public at large is greater than, and master over, self-interest. There is not as much love of justice on the part of the people as a whole, as is needed for the protection of every utility, whether it be publicly owned or privately owned. There is not enough of the pursuit of justice on the part of the people as a whole, to properly protect the utilities. There has not been enough of the so-called public spirit to assess or expend the revenues of our municipal, state or national treasuries to the satisfaction of even the best of the people.

In short we have endeavored to show that "it is none too soon for utility men to be interested" in matters of this nature; none too soon for business men in general, and for utility men in particular, to interest themselves in the standardization of economic progress; none too soon for them to awaken to the fact that even in the matter of ownership "standardization is not stagnation."

Until such questions as ownership and operation have been studied, little if any profit can be obtained from a study of rates, rate regulation, monopoly, competition, regulative commissions, etc.

37. *The Changing Order of Affairs.*—"The tendency is toward an increasing public interest in private property, but no tendency whatever is discovered towards the abrogation of the right; and this is clearly the drift of the decisions of the American courts," says a noted economist.

One extremist overlooks one thing and another extremist overlooks another. The practical man is apt to forget how fast things have changed. He is apt to forget how fast the change has proceeded, during recent years, in this matter of ownership. He is apt to forget that this change is still going on and may say: "This public ownership craze will soon 'blow over'—just as all other populistic notions have passed away."

The theoretical man is just as prone to forget that, even though it be conceded that his ultimate ideal is worthy, we must deal with certain existing customs and conditions. He is likely to forget that "things as they are" cannot be ignored.

One economic writer says of economists as a class that while they do not openly deny the existence of "things as they are," they say little if anything about the matter. They proceed very much as though they felt at liberty to disdainfully ignore "things as they are." But the man who is managing a utility, is not privileged to ignore this matter of ownership. Neither is he privileged to dodge the matter of operation.

38. *Utility Economists' Interest in Operation.*—One might prefer to deal first with rates and other similar matters. He might wish to consider the things which, from the surface, seemed to affect more immediately the obtaining of means for extensions and improvements. But the courts of last resort have decided that the operation of a utility property must be "fair and reasonable"—even though the property is privately owned. Some may not have discovered the fact, but it is the present variance and uncertainty of court decisions, commission rulings and of customs in general that is frightening capital It is this uncertainty as to reasonableness of rates and operation matters generally that is frightening capital away from certain utility undertakings. Hence we cannot properly consider other matters until ownership and operation, each in its relationship to the other, have been considered. Either public ownership or private ownership of utilities can not be considered without considering the equally important matter of operation.

39. *Theories of Ownership.*—Of the many theories of ownership, only the two which are at opposite extremes will be discussed. "Proprietorship is privilege," say the extreme individualists. Extremists of this class contend that the right of property or ownership carries with it the license to misuse or abuse the thing owned. Under their extreme theory, an owner must be allowed to kill, in the days when the law made him the owner, his slave, his wife or his child. In the present, he must be allowed to burn his house or barn as a proprietor's right.

"Proprietorship is pelf (or, property is theft)," say the extreme socialists. These people say they are opposed to allowing any individual to have the slightest degree of proprietorship over anything, whatever. They want everything held, as to proprietorship or control, in the same manner as are our city halls, county court houses and public wagon roads. This class say they want to abolish private ownership completely. But they would probably object to having the texture, color and style of their clothing determined by law, and would probably object to a public drinking cup or a public tooth brush. The extreme opponents of public ownership, the ones who say property is privilege, might say they object to the public owning anything. If it were proposed to sell to private owners, the road, street or alley that extends in front of their farms or city lots, they would again object.

Everybody believes, more or less, in the private ownership of some things; and in the public ownership of other things. Some would go farther in one direction and others would go

farther in the other direction. All would agree that whether publicly owned or privately owned, the operation of property should conform as closely as possible to the rule of the greatest good for the greatest number.

"Proprietorship is responsibility." This is the theory which the author presents as a golden mean between the two extremes. It might be better to say, "Proprietorship is responsibility; ownership is opportunity." We need to remember that "the tendency is toward an increasing public interest in private property." The tendency is to deny to the claimant of a field, the privilege of raising weeds upon idle land while idle men are in want of potatoes. The inclination is to condition the right of proprietorship more and more upon the satisfactory using of the thing thus owned, whether the ownership be public or private.

(To be Continued)

The Passing Show of April

Is the Public Mind Changing?—Domestic Developments

By J. C. Kelsey

Chicago has just elected a mayor. It actually elected a rich man. Would you believe it, a rich business man has been placed in the mayor's chair.

It placed a man there who is entirely out of sympathy with theories. He is a hard-headed man of business. Chicago elected him unpledged, save to try to bring order out of chaos and confusion.

There is no dispute about it. You know, and I know, that chaos and confusion exists. Something is wrong.

For years corporation baiting has gone on unchecked. Corporations have been harried and worried—many deserved it. They have been jerked up before courts and commissions and put to millions of needless expense without the recourse of being compensated. The ghastly picture of decreasing receipts and increasing expense is no theory. It is a condition, an ugly one too, and one you do not like yourself.

Have the people of Chicago really voted to put a stop to such conditions before it is too late?

The double-edged war on all corporate business has caused it to economize. That is where the people lose sight of the most vital thing. Neither corporations nor individuals with decreasing receipts and increasing expenses, are going on forever without drastic changes. Naturally, they economize. As a first result, men walk the street seeking other work, while women and children wait patiently at home for the resumption of their natural way of living.

A man out of work throws the whole family machinery out of gear. With armies of men out of work, forced out possibly by their own belief of needed reform, the whole nation suffers in a like proportion.

Chicago people voted for a full dinner pail. They voted for something which is not at all psychological—simply and fully, practical.

We have heard a great deal of optimistic talk, especially from the government. We have tried for many months to believe that our troubles are only psychological but, month after month, showed nothing except hard facts. So men, generally, have come to believe that depression is real.

If they have not, why did they rush a rich man to a big office by the largest majority ever known? Surely, the signs are plain.

It would have been much better if the depression had been admitted to be real. Even before the war, the world at large was resting on its oars, conscious of being out of breath, and wondering where it was going to get off.

Every nation was full of trouble. There was labor disturbance everywhere. Unemployment existed all over the world—surely not a pleasing thing. It will not be a surprise to read in future history that the war was started for no other purpose than to get the minds of the mob off their troubles, and as well, to kill off a few of them.

In our country, we really should be pleased to bear our burdens because, in comparison to Europe, we really are joy-riding. Whether or not Washington is to blame for the depression in America, we should feel well paid to be kept out of war.

National pride is one thing and foolish war is another. The trouble is that the people who are not offended by affronts to our natural pride are usually the ones who stay at home. They buy substitutes for their sons, and make a fortune by capitalizing the misfortunes of the patriots who enlisted.

Chicago has voted to stop theoretical interference of business. Its people want some work. Of course, Chicago is only 2 per cent. of the United States, hardly an appreciable part. It is possible that Chicago news is not known to more than 2 per cent. We can hope, at least, that the news has been carried to Washington, so that the various and numerous boards, commissions and dispensers of new freedom, will hear of it. It is hoped that in their dying gasps, they will try to prove their sincerity of purpose by enforcing some of their laws.

I have in mind the Clayton law which forbids interlocking directorates and insists upon competitive bids on quantities exceeding $50,000 in value. The law seems to fit absolutely into our telephone lives as well as that of railroads.

The Bell factory and the operating Bell company have already divorced their respective directors. If that act is all that has become necessary to meet the laws of the new freedom, then may we all laugh at the futility of theory in practical affairs.

If, after all the roar and racket of reform, this simple act of changing directors meets all its conditions, then we know that out of the great political mountain has come a mouse.

If the simple act of divorcing directors is all that is needed, we should know it. If this is all that can be accomplished, we had better plan to hold our peace and attend to our business on a strict basis of the survival of the fit.

Attorneys will instruct us upon our rights. I promise that, if we have no rights, you have heard the last word about the telephone business in a caustic way. We have a fine business, and it is a pity that we are compelled to stop and bark up trees.

Let's have our investment bank and cultivate our own business as our ancestors had to.

Making people buy from us when they don't want to, is a heartbreaking game at best. If Independent telephone men were all really wide awake to their best interests in maintaining prosperous Independent factories, there would be neither need of law nor cause for worry.

I am going to change the subject abruptly. It is in keeping with the thought of political interference.

Why does not the municipality and state act in as good faith as it expects its public servants to act?

I know of numerous cases where the honor of the municipality or state, has no higher plane than that of a porch-climber. And on top of it, people wonder why investors will not invest in their glittering promises.

The people of a particular town, believing that they were being enslaved by an industrial monopoly, cry loudly for relief and vote a franchise to a competing monopoly.

After the people vote the second utility in, they have entered upon a sacred obligation, just as binding as their bonds, to protect the investment in the relief utility. If the people fail to support the second utility, the public is under obligation to shoulder the loss.

The public, by its own voluntary act, pledges itself to allow the cost of the defeated competitor's plant to be capitalized by the victor. Any evasion of this obligation places the municipality or state on a plane no higher than the outlaw it so cheerfully sends to jail. This is especially true when the public apparently and wantonly admits a second utility, only to use it as a foot ball or a club to bargain with the pioneer utility.

A dozen years ago some Eastern investors were persuaded to go into the telephone business in a Southern state. They built exchanges in two cities of medium size and charged very low rates.

A third city, believing that it was being robbed by the Bell telephone interests, sent up a great hue and cry for relief. The Bell rates were not unfair but, regardless of this fact, a new franchise was granted to a second company. Some 1,600 subscribers enthusiastically signed contracts for the new and emancipatory service. This enthusiasm induced the Eastern people to extend their field of operation, and then the trouble began.

These Eastern investors were in the telephone business in good faith. They listened to the deceptive cry of the alleged-to-be-abused community, and invested $250,000 in exchange and toll lines. Now what happened when the investment was made and the plant completed? 1,600 subscribers signed contracts; 1,000 subscribers accepted telephones; and 400 subscribers paid their bills.

Naturally the plant did not pay. The toll lines remained idle. After four years of heroic effort, the exchange shut down. There stands, today, in a Southern city, a magnificently built telephone plant, a martyr to a misguided, fickle and irresponsible public.

No wonder investors have grown tired of the cry of "wolf"! They have reason to know that many of the alarms are false.

The people of this municipality legally authorized an investment of $250,000 in their behalf, one that should never have been made. It was a lawful contract in which the people pledged themselves to make use of the property and allow a fair return on the investment. The law has allowed these Eastern investors to be as shamefully duped as in the most ordinary swindle, yet no one is responsible in either state, or municipality for such outrages.

A $250,000 investment lies idle. The investors, most of them Eastern widows and orphans, having nothing but ruin ahead. But the law, as it is written by politicians, says that they cannot quit, nor can they sell, nor make adjustment with their victorious competitor. They cannot recover their money, nor a part of it, even if they have a chance, for the law says that the only possible buyer cannot buy it.

Does such a condition encourage future investors? Does such a law encourage thrift? Look square at the face of it. Will anyone invest money where they cannot buy and sell? Such restrictions reveal economic follies which no state can afford to indulge in.

Suppose you were in their boots. Suppose your plant, built for 2,000 subscribers found itself stripped to 400, and you were losing money every day. What would you think of a law which would not allow you to quit even after you were ruined? Is there any law of reason, or common sense, which compels you to go on giving service to a community which has basely betrayed you? It is as silly as compelling a man in the water, not to save himself when he can swim.

What would you do? What would your board of directors do? What advice would you give to a group of investors who listened to the deceptive whine of the public and invested in a gold brick?

I know what you would do. You know what I would do. You and your board of directors could not consistently put up another dollar of capital, for if you did, you would be unfair to your stockholders. You would do as others have done. You would endeavor to buy your competitor or sell out to him.

In the law of survival, you would endeavor to sell in this case. Really you would have the right to sell, because the public, when it willingly encouraged a competing company, gave the survivor the legal right to buy the loser and amortize the losses.

Finance will not fight in a closed room where one of two contestants has to die. It wants the right to surrender with honorable terms.

What can be worse, anyway you look at it, than the pretense of competition? One company out of operation in a city, certainly dismisses the thought of even potential competition.

The public will get fewer favors from the victor at a time of pretense of competition than when the mask is off. Further, what can be worse than the punishment of innocent investors at the time the community is receiving doubtful benefits?

We all believe in curbing rapacious and lawless monopoly, or any form of it, but it is wrong, in our zeal, to go to such extremes that we are thrown into worse conditions of servitude. There must be common sense in the administration of the law. It cannot be divested of all the elements of business law, if business is expected to go on.

Most of all, investments cannot be made the football of a community, nor the vehicle of ambitious politicians to carry them into office, if the state expects any future money.

That is what the Chicago election means. It serves notice that investors have some rights which politicians are bound to respect, if they would continue in office.

Anyway it is capricious April. In spite of gloom, ill treatment and handicap, business seems to be leaning forward.

Railroad earnings for 1915 exceed the same period of 1914. February exports exceed last February by $100,000,000. The wheat crop is almost ready and its acreage, which exceeds any previous season, promises 619,000,000 bushels. If the price keeps up close to the present one, it means that one billion dollars will add its effect to business.

There is a rising tide of prices. There have been some favorable decisions to corporations. Their investors are feeling more hopeful. Even European money is being invested in American securities. We have had a great wave of economy and saving. This money is going into the channels of real industry. We are the safest spot of the world.

Finance recognizes the importance of our wheat crop, knowing that successful agricultural countries are ever first to recover from internal and external disaster.

Not for several years has there been such a nation-wide demand for stocks from the small investor. The public generally seems to feel that the tide of reform has been turned and constructive legislation will again find a place.

There seems to be a belief that the war will end before August 1. It surely would make a nice anniversary gift. No reason seems to exist why construction work will not yet keep the multitudes busy. We cannot live by maintenance alone.

The sudden ending of the war may possibly present some unexpected phases. The principal problem to be expected, involves an effect on interest rates. Will the European manufacturer continue to have the advantage of a very low interest rate? Or will he have to pay a higher rate, one that American industry is accustomed to?

After the Napoleonic wars, interest rates did rise and reached from 7 to 9 per cent. And after the Crimean war, the English interest rate, which averaged less than 3 per cent. rose to 4½ for five years after. On this basis, our 6 per cent. average would rise to 9 per cent.

It is hard to see how we can avoid some disturbance to our interest rates. Today, the stock market reveals the presence of the offering of foreign governments which yield the investor close to 6 per cent. Such a condition as this, for the governments' credits are gilt edged, is bound to have a contrary effect on our standard 4½ and 5 per cent. investment offerings.

This is what makes the bankers play a waiting game, although there is nothing about it which can cause the least alarm. It may be that telephone bonds must rise to a 6 per cent. basis—that is about the limit.

There is no dispute. The decade of political interference with business has borne its fruits. It matters not whether Democrat, Progressive or Republician ranks control. We are paying the penalty of reduced income, increased expense and unwarranted interference with ordinary business routine.

Is the Chicago election a warning sign? If so, let all take heed.

MORAL: Coming events cast their shadows before.

British Telephone and Telegraph System Shows Deficit.

There is much food for reflection, says TELEPHONY'S London correspondent, in the balance sheet figures of the comptroller and auditor-general of the British post office for telephone and telegraph activities for the year ending March 31, 1914, just published. The figures show a deficit of £6,058,710 for the telephone and telegraph systems of the United Kingdom for the year ending March, 1914. In the year 1912-13 the deficit was £5,876,735.

As regards the telephone service alone, the telephone net revenue account for 1913-14 shows that after allowing for interest on capital, depreciation and certain contingent liabilities, the surplus on the year's working amounted to £1,195,555, as compared with £1,516,715 for the previous year. This surplus is equal to 1.10 per cent on capital as compared with 1.47 per cent in 1912-13.

The gross revenue from telegrams, telephone rentals and fees, private wires and newspaper wire rentals was £52,341,990. The balance of expenditure over receipts totalled £340,170.

Report of Alberta Telephone Department.

The annual report of the Alberta Telephone Department shows a capital investment of $8,552,087. The total number of exchanges in operation is 165 with a total of 27,514 subscribers, 18,192 on exchanges and 9,322 on the rural or farmer lines.

Owing to the war and consequent depression in business, the decrease in exchange subscribers is 862. The number of rural line subscribers, however, has increased 703 over the preceding year.

There are 16,112 miles of wire on long distance lines and 3,845 miles of pole line, while in the rural system there are 27,722 miles of wire and 8,345 miles of pole.

The gross revenue for the year was $991,616.64, which is 12.10 per cent. on the total investment. The cost of operation was $343,843.33; maintenance, $174,458.47; extraordinary maintenance, $11,416.92; interest, $381,515.19; sinking fund, $44,201; uncollectible and cleared, $6,611.29. This leaves net earnings of $29,570.34.

It will be noted that there is no depreciation allowed and that the capitalization is $310.82 per telephone. The total reserve to date is about $475,000 since the inception of the telephone system in 1907.

No doubt if this system were owned by a private company it would have a deficit with these figures, but under the paternal care of the government it is able to show a profit even if it is only a paper profit. In this matter Alberta is doing better than Manitoba and Saskatchewan, which have acknowledged a deficit with a smaller capitalization per telephone.

March Income Statement for San Marcos (Texas) Company.

The total operating revenue for the San Marcos Telephone Co., of San Marcos, Texas, for the month of March was $1,143. The total expenses, including $799 for operating expenses, were $852, leaving a surplus of $291. The statement of assets and liabilities of the company, as of April 1, 1915, follows:

ASSETS.

Intangibles	$ 5,000
Central office equipment	5,875
Station equipment	8,330
Exchange lines	15,127
General equipment	965
Total plant and equipment	$35,297
Cash on hand	351
Due from subscribers	727
Materials and supplies	236
Prepayments	106
Total assets	$36,717

LIABILITIES.

Capital stock	$20,000
Notes payable	1,000
Accounts payable	736
Accrued liabilities not due	100
Depreciation reserve	7,153
Other credit accounts	73
Surplus	7,655
Total liabilities	$36,717

The San Marcos Telephone Co. has a total of 694 telephones in operation, an increase of 18 over the same month for the previous year.

A. T. & T. Official Reports Conditions Improving.

N. C. Kingsbury, vice-president of the American Telephone & Telegraph Co., who has just completed a trip through the West, states that he found conditions improving everywhere.

"The company's business is picking up in every section. The general situation is looking up," he said. "There is a return of confidence all along the line. Crop conditions in the West, from what I observed and from what persons told me, are fine. There is a big acreage planted, especially in wheat, and the present indications are that crops will be splendid. The telephone business is on the gain practically all over the country. The transcontinental business is going ahead normally."

He said it was too early in the year to determine whether the telephone company's gross business was increasing at the normal rate of 10 per cent. annually. Last year the company's growth was retarded and the increase was about 5 per cent.

Practical Subjects—Letters and Discussions

Unique Service at a Surprise Party.

The telephone was used in a unique manner, furnishing much surprise and entertainment at a pre-nuptial surprise party held in honor of a bachelor friend at one of Boston's leading hotels, says the New England Telephone Topics. A stag dinner party was arranged for, but whether or not it could be termed "stag" is yet a question. A telephone connected directly with the central office was installed for that particular evening. It was located at the place of the surprised party in the banquet hall. The significant number 41, FO(U)R ONE, was assigned.

A bell of the Moore gong type was attached to the under part of the bachelor friend's chair. During the entire evening, calls were received at brief intervals from a large number of his young women friends and others of the feminine sex, which furnished much amusement for the entire gathering. The telephone part of the entertainment was more or less of a surprise to the individuals who attended the banquet as well as the bachelor friend. It was arranged for through the sending out of a large number of invitations, which read as follows:

A SECRET

Mr. George Blank will be pleased to talk with you at 142 *White Street, on Friday evening.*
His number will be Back Bay 41.

Secretary C. F. H. Committee

Call promptly.
Time limit 3 *minutes.*

The secretary for the committee who sent out the invitations arranged the time the calls were to be made, so that the evening was pretty well taken up at the telephone as well as with the friends present.

Locating a Troublesome Short.

I found and cleared up a hard case of trouble a few months ago by a method which might be of interest to others. We have a P. B. X. switchboard in one of the hotels in this city, which is supplied with battery from two sets of dry cells of 18 cells each. By means of a double throw switch, the operator is able to alternately connect each set with the board, thereby giving the cells time to recuperate.

For the last two years there was a leak somewhere in the system. It was impossible to make a set of batteries last more than two weeks, when they would be entirely exhausted. As there was no number on the board, we could not get any blueprints of the circuits and as it was not a standard board, nobody seemed able to locate the trouble. Every equipment man who came here was asked to try and locate the trouble, but they all gave it up.

One day last winter, the wire chief asked me to see what I could do with it. I took a receiver and a couple of dry cells and went to the terminal in the basement and opened every line and tested for a short circuit. Every line showed a good condenser on the telephone and told me that the trouble lay toward the switchboard.

Some months after, having a little time, I said that I was going to find and clear up that trouble. I first took a small 100-ohm coil that had been made for an exploring coil, and fastened a common small pocket compass to one side of it. This gave me a galvanometer, which showed a deflection whenever any current flowed through the coil.

Going to the back of the board, I disconnected the battery from the bus bar. Connecting the coil in series with the battery wire, I began to search for a leak and upon touching the third terminal got a strong deflection which gave me a start. Tracing the wire from the terminal, it led me to the relays on the cord circuits. Disconnecting the battery wire from the common side of the bank of relays, I again began to hunt for a flowing current. Upon reaching the relay on the eighth pair of cords I found it. Further search showed a short in the twisted pair leading to the repeating coil on that particular circuit.

Clearing that, cleared up the leak and the set of batteries which before had to be renewed every two weeks, now last six months and over. The difference in saving on batteries will amount to about $90 a year.

Traverse City, Mich. F. W. Crowe, Wire Chief.

Overcoming Maintenance Troubles from Moisture.

To the general public Atlantic City, N. J., is known for its excellent climate, but to telephone men it is noted more for the large amount of humidity in the air, which is a severe tax on the insulation of the central office cable forms, distributing frame wires and switchboard cords. Official figures from the United States Weather Bureau show an average humidity for the months of July and August of 78 per cent. for Atlantic City against 66 per cent. for Philadelphia; and for the year, 80 per cent., against 68 per cent.

This moisture has caused much trouble, not only in our central office, but also in the private branch exchange boards among the beach-front hotels, where it saturates the cords and finds its way into the condensers of the hotel telephone sets, says G. C. Harris, in The Telephone News.

In the Atlantic City central office, the moisture has caused considerable trouble in the terminal room which is right next to the ground, cellars being almost unknown in this section. Here it has found the weak places in the butts of cable forms on the main and intermediate frames, at times showing almost solid trouble, while in several places the ringing current has actually set fire to the insulation on the jumper wires.

When this trouble was first noticed it was believed to be an inherent weakness in the method of insulating at the butts. The first efforts were therefore devoted to clearing the trouble at once. A number of incandescent lamps were arranged with asbestos guards and placed near the forms affected. These lamps soon expelled the moisture, after which the forms were given a coat of shellac. This method proved to be fairly effective and was used the first season, but the lamps concentrated the heat so much that extreme caution was necessary to keep them from charring the forms.

The next summer a different method was tried. The intermediate distributing frame was covered with tarpaulins and several Bunsen burners were arranged at one end of the frame, with an electric fan behind them so that the heat would be driven up and under the covered frame. For the main frame, sheet metal forms were arranged to fit around the protection strips, and Bunsen burners and fans were provided as on the intermediate distributing frame. This method was more efficient than the lamp method but was very inconvenient for workmen engaged in cross-connecting; it required considerable attention, but was a decided fire risk. It was used for about half the season and then again supplanted by incandescent lamps.

The next season the engineering department decided to have the forms which showed the heaviest leak cut back and to rewax them, with the idea of sealing up the places where the moisture

entered. While men were engaged in rewaxing the forms, electric foot warmers were given a trial, and although not quite as cheap as the gas, they were convenient and safe. The following summer the rewaxed forms proved to be as leaky as before and it was agreed that some permanent and efficient type of heating device was necessary. Permanent electric outlets were arranged under the frames and foot warmers installed. These were used for two seasons and were very satisfactory, but an inspection of the electric light bills showed them to be very expensive, costing $125 per month, so a search was made for a cheaper method.

Calcium chloride was next tried out. A quantity of calcium chloride was put into a perforated cake pan, which was placed in a second receptacle. The chloride has the property of absorbing a large percentage of the moisture from the air which circulates in contact with it. The moisture which is absorbed is condensed and accumulates in the lower receptacle in the form of water. These receptacles, which were placed at intervals in the switchboard sections and under the frames, gathered an astonishing amount of water. They were emptied daily, with frequent replacements of the chloride.

This plan was soon discarded on account of the frequent renewals and constant attention required.

Next fans were placed in the switchboard and terminal rooms with a view to drying the air by circulation. The results were unsatisfactory, and finally the steam heating boilers were kept going during the periods of humid weather. The steam heat kept things dry enough but made life almost unbearable in the terminal and operating rooms. This supplied an idea, however, and in the spring of 1913 hot-water heating pipes were placed under each frame and connected with a gas hot-water heater.

This system has been in use for nearly two seasons and has kept the forms perfectly dry. It does away with the concentration of heat of the other methods and requires very little attention. It does not interfere with work on the frames, is not dangerous, and does not raise the temperature of the terminal room more than ten degrees. The gas heater is a commercial one, such as is found in many kitchens, and is equipped with a thermal gas-regulating valve whereby any given temperature of water can be maintained automatically. Normally the flow of gas is so regulated that a temperature of 75 degs. Fahr. is obtained at the entrance to the pipes. A comparison of costs shows a saving of 80 per cent. over the electrical methods, the gas costing about $20 per month; and as there is no maintenance or fire risk, it seems to be a more satisfactory system in every particular.

In the smaller offices and in the private branch exchange boards, 50-watt electrical heating units with standard Edison bases are used with excellent results. The South Atlantic central office, which was cut over June 2, 1912, presented a special problem as regards dampness: It is situated on a narrow part of the island, about 200 feet from the ocean and not over a half mile from the thoroughfare. The engineering department provided for the dampness in this case by installing a special enameled switchboard cable, but tests showed considerable dampness which located in the jumper wires and on the connecting blocks, both on the main and intermediate frames. An emergency clearance was made by starting the heater, after which glass partitions were erected so as to separate the operating and terminal rooms. This partition makes the rest of the switchboard and the terminal an almost air-tight compartment, and as the terminal room is on the sunny side of the building no further trouble has been experienced.

Business That Pays 100 Cents on a Dollar.

Every manager takes pride in his exchange and wants to boost it just as high as he can, says an employe of the Federal Telephone & Telegraph Co. of Buffalo. Business? Yes, we are looking for business. That is the every-day life of a manager. But right here I believe every manager should be careful in soliciting the good business, the business that pays 100 cents on a dollar.

The Federal Telephone & Telegraph Co. is just like any other corporation. It is not run on promises or excuses, but is run on the good old American-dollar plan.

A manager may have his exchange construction in fine condition, his service A No. 1, his office fitted up in the best way. But if he is not producing 100 cents on a dollar for the service he is furnishing, then his beautiful exchange is a failure financially. Fencing to get that 100 cents for the dollar of business he had done, has sent many a business man to the wall.

We figure up our exchange bank book at the end of the year and think to ourselves, "Buffalo must have cleaned up a bunch of money on my exchange last year. Just see all the money my exchange has produced."

I wonder if we all figure up along with the bankbook how much Buffalo has written off of our books for worthless accounts—business that we have done that we never got a dollar for. This is the item that hangs the little card on the business man's door—"Closed."

If a subscriber cannot pay at the end of the quarter, how is he going to pay a larger account? Take this home to ourselves. If you force the subscribers, they will pay. They may get very angry at the time, but they will get all over it, and they will respect you more for it in the end.

There is a manager in the Federal company that I will take my hat off to, and that is Manager Woods, of the Corning exchange, leading his group twice in succession. It certainly shows his subscribers are paying their bills when due; and that he is getting 100 cents out of the dollar.

I have noticed that if a man owes a large account his service is rotten; if his bill is paid to date, his service is fine. So, then, it is not the operator or the line. It is simply that the subscriber has a grouch because the manager has let him run up a large account.

The point I want to bring out is this: If a manager's collections are in good standing, it helps Buffalo; his exchange; his service; his subscribers and makes the whole motor of his exchange run a great deal smoother.

A Profitable By-Product.

We have found a profitable earning in the recharging of automobile starting and lighting batteries. We do this work during the daily charge of our main battery, 42 volts. This sort of business is a natural by-product, you might say, of the telephone business. At an expense of about $25, we installed a charging panel with resistance and instruments so we can care for any of the standard voltage batteries.

Our earnings now from this source run from $8 to $10 a month, over and above the amount of our natural gas bill for gas engine, for our entire charging plant.

It is good business when you can transform a fixed charge into a revenue producer.

E. G. Miller, General Manager,
Warren, Ohio. The Warren & Niles Telephone Co.

Reighard Bill Recommended by Ohio House Committee.

The Reighard bill, which provides that decisions upon the matter of rate-making physical valuations be left to the discretion of the public utilities commission has been recommended for passage by the public utilities committee of the Ohio house of representatives. The bill provides, further, that in the event a city council demands a valuation of a public utility, the commission may first make an investigation to decide whether it is necessary.

Proceedings Before Commissions, Courts and Councils

Discussions and Rulings of State Bodies Having Supervision of Telephone Companies, Decisions of Courts in Matters Affecting Public Relations of Utilities and Actions of City Councils Bearing Upon Franchises, Rates and Service

Outlook Favorable For Massachusetts Investigation.

The mercantile affairs committee of the Massachusetts legislature has reported an appropriation of $15,000 for an investigation of telephone rates in the state by the public service commission. As Governor Walsh favors the inquiry and as the New England Telephone & Telegraph Co. has gone on record in favor of the work, it is highly probable that the resolve will be passed at the present session.

At a hearing held last week at Boston by the legislative committee on mercantile affairs, the recommendations contained in the inaugural message of Governor Walsh for an investigation of telephone rates and service in Massachusetts and for the transfer of the supervision of telephone and telegraph companies from the public service commission to the gas and electric light commission, were considered.

Representative Samuel Mildram, of Dorchester, declared that the time is now ripe for a judicial investigation of telephone rates and service in the interests of the public and of the company alike. He contended that as the result of the recent investigation in New York state, the public in the last 15 months has benefited to the extent of $5,000,000 in rate reductions. Mr. Mildram said that the investigation cost the state only $58,000 and that he believed the proposed investigation in Massachusetts would not cost over $25,000. The speaker favored granting the public service commission an appropriation for this work, the board already having authority to conduct the inquiry.

Frank W. Thayer, of Boston, said that under the guise of reducing rates in Boston the company had actually increased the rates when the unlimited service was taken away. "No community has been so consistently and persistently 'soaked,' as has Massachusetts," said the speaker, "by this company." Former Senator Thomas W. Vinson said that the whole question resolves itself down to its financial aspect. He said that Massachusetts legislators cannot afford to withhold from the public service commission the money necessary to enable the board to carry out the duties imposed upon that commission by the legislature.

Edward K. Hall, vice-president of the New England Telephone & Telegraph Co., said that the company is not opposed to an investigation of telephone rates if the legislature believes one should be made. "Such an investigation will not hurt the company," said he. "In fact, it will help the company. The more the commission knows about the company the better." Mr. Hall said that he opposed any proposition assessing the cost of the investigation upon the company, which had not long since borne the expense of one costing $175,000. The speaker did not favor the transfer of supervision from the public service to the gas commission, stating that in his opinion the present arrangement is more desirable.

Southern Telephone Co. of Indiana Incorporates.

Permission having been granted by the Indiana Public Service Commission to the Cumberland Telephone & Telegraph Co. to transfer its properties in the southern part of Indiana to the Southern Telephone Co. of Indiana, the articles of incorporation of that company have been filed. The incorporators include Edwin D. Wemyss, William E. Hopkins and J. W. Brady, all of Evansville, which is to be the company's headquarters, John M. Hoxey, of Atlanta, Ga., and Frank L. Woodruff, of Louisville. The capital of the new company is fixed at $3,000,000 and the company will operate in the following counties: Clark, Crawford, Floyd, Dubois, Gibson, Harison, Perry, Posey, Spencer, Pike, Washington, Vanderburg and Warrick.

The public service commission scaled the $2,050,000 at which the Cumberland company listed the value of its property in the territory affected to $1,760,000, and will take up in the near future the question of adjusting rates, which are not uniform. The new company will ask permission, it is stated, to issue bonds for the purpose of securing $80,000 working capital.

Ruling in Michigan Pole Tax Case.

The city of Pontiac, Mich., lost its case against the Michigan State Telephone Co. which was decided by Judge George W. Smith of the circuit court in an opinion recently handed down. The court held the city ordinance providing a license for the rental of the streets by telephone, telegraph, light and power companies, to be invalid, because the city had attempted to compel the companies to pay too large a sum. The court held that the city had a right to charge a nominal fee each year for the inspection of poles but that it had no right to rent the city streets.

An ordinance enacted by the city and put into effect February 1, 1913, imposed an annual license of 30 cents per pole on all telephone and telegraph poles standing in the city streets or alleys.

The city case against the Michigan Telephone Co. was started some time ago. It was recently heard in the circuit court and taken under advisement. The city brought the action to compel the telephone company to pay the license fee and at the same time test the validity of the ordinance.

Rights of Telephone Exchange Regarding Rural Patrons.

An interesting question has been brought before the South Dakota Railroad Commission in which it will probably have to decide upon the rights of a telephone exchange in a town in regard to supplying exchange service to residents outside the borders of the town. It appears that John W. Steadman, who has filed a complaint against the Beresford (S. D.) Telephone Co., lives on a farm which joins the Beresford townsite with his buildings a short distance from the town limits. Some time ago he agreed with the Beresford company, to construct a connecting line between his house and the nearest line of the company, on which he was to be given connection with the city exchange. This arrangement lasted until the early part of this year, when the manager of the company cut the complainant's telephone from the city exchange and connected it up with a rural line. Mr. Steadman objects and claims rights under his agreement which will have to be adjudicated by the commission.

Minnette Bill Becomes Law.

The Minnette bill, as amended and passed by the Senate committee of the Minnesota legislature, has been concurred in by the House and upon signature by Governor Hammond becomes a law, effective July 1.

Ruling on Advance Collection of Telephone Rentals.

Under a ruling recently handed down by the public service commission on the complaint of citizens of Columbia, Mo., against the telephone system owned and operated in that city by J. A. Hudson, under the name of the Columbia Telephone Co., a telephone company is entitled to charge and collect in advance three months' rental for

the installation of service for a new subscriber. After the expiration of the first three months the company cannot demand rental in advance for more than one month.

Injunction Against City of Birmingham, Ala., Dismissed.

The federal court has dismissed the injunction brought over a year ago by the Southern Bell Telephone & Telegraph Co. of Birmingham, Ala., seeking to restrain the city from interfering with telephone rates. The bill was filed following the repeal by the city of its five-year contract with the telephone company. The injunction was dismissed on the grounds that there was no equity in the bill.

A bill is now pending in the legislature which gives the city the right to regulate telephone rates. If the bill passes, the city will be empowered to regulate the rates by city ordinance.

Indiana Company Reduces Toll Rates.

The Jasper County Telephone Co., of Rensselaer, Ind., has reduced its toll rates to several nearby points five to ten cents.

Summary of State Commission Hearings and Rulings.

ARIZONA.

April 12: Hearing in the case of the Duncan Telephone Co., of Duncan, Ariz., vs. the Mountain States Telephone & Telegraph Co.

ILLINOIS.

April: Empire Telephone Co., of Neponset, Ill., authorized to increase rates.

April 8: Macedonia (Ill.) Telephone Co. given permission to change rates and end discrimination.

April 8: Warren Mutual Telephone Co., of Bath, Ill., given permission to change rates and end discrimination.

April 8: Agreement between Murphysboro (Ill.) Telephone Co. and McLeansboro (Ill.) Independent Telephone Co. for the purchase by the former of the McLeansboro property of the latter, approved.

April 8: Receivers of the Central Union Telephone Co. and the Thebes & Cairo Telephone Co. given permission to operate their lines in connection with each other at Thebes, Ill.

April 8: Pearl City (Ill.) Independent Telephone Co. ordered to re-establish in ten days connection between the Kent Independent Telephone Co. and the Pearl City Mutual Telephon Co. It is held that the disconnection of the Kent lines from the Pearl City company's exchange was not legal.

April 8: Farmers' Telephone Co., of Waynesville, Ill., given permission to change rates and end discrimination.

April 8: Receivers of the Central Union Telephone Co. and Rio (Ill.) Telephone Exchange given permission to operate their lines in connection with each other.

April 8: Leonore (Ill.) Mutual Telephone Co. given permission to change rates and end discrimination.

April 8: Receivers of the Central Union Telephone Co. and the Milford (Ill.) Telephone Co. given permission to operate their lines in connection with each other.

April 8: Receivers of the Central Union Telephone Co. and the Chatsworth (Ill.) Telephone Co. given permission to operate their lines in connection with each other.

April 8: Freeport Telephone Exchange and Orangeville (Ill.) Independent Telephone Co. given permission to operate their lines in connection with each other.

April 8: Receivers for the Central Union Telephone Co. and George H. Vermillion doing business as the London Mills Telephone Co., at London Mills, Ill., given permission to operate their lines in connection with each other.

April 8: Freeport Telephone Exchange and Pearl City (Ill.) Telephone Exchange, given permission to operate their lines in connection with each other.

April 8: A. B. C. Telephone Co., of Abingdon, Ill., given permission to change rates and discontinue discrimination.

April 8: Receivers for the Central Union Telephone Co. and the Farmers' Mutual Telephone Co., of Carpenter, Ill., given permission to operate their lines in connection with each other.

April 13: Hearing in regard to application of the DeKalb County Telephone Co., Sycamore, Ill., for authority to increase telephone rates at DeKalb, Sycamore and Malta.

INDIANA.

April: The public service commission has granted the Cumberland Telephone & Telegraph Co., owner of 44 exchanges in the southern part of Indiana, permission to sell its properties to the Southern Telephone Co. of Indiana. No protest was entered against the sale of the company.

April: Application of the Monroeville (Ind.) Home Telephone Co. for permission to increase its rate to $1.25 a month, denied.

MISSOURI.

April: Application filed by the Buffum Telephone Co., of Louisiana, Mo., for permission to sell its plant at Auxvasse, Callaway county, to Frank Holland.

NEBRASKA.

April 14: Hearing in regard to application of the Monroe (Neb.) Independent Telephone Co. for permission to issue $15,000 worth of stock.

NEW YORK.

April 12: Hearing in regard to complaint of the Beecher-Lisle Telephone Co. and other telephone companies against the New York Telephone Co. as to increased rates.

OHIO.

April 20: Hearing in regard to the protest of the Lima, Ohio, city council against the rates, service and legality of the Lima Telephone & Telegraph Co.'s action in raising its charges above those specified in the franchise ordinance of 1895.

OKLAHOMA.

April: Application filed by the United Telephone Co. for permission to increase its rates at Afton, Okla., 50 cents a month on both business and residence telephones.

May 3: Postponed hearing in regard to complaints of Independent telephone companies of Oklahoma, charging that the Pioneer Telephone & Telegraph Co. is making threats or actually removing its toll line connections as a means of forcing the complainants to sign contracts for a division of long distance receipts more generous to the Pioneer than the Independents agree to concede.

PENNSYLVANIA.

April 27: Hearing at Harrisburg, Pa., in regard to the proposed schedule of uniform telephone rates throughout the state, a subject which has been under investigation for nearly two years. April 15 has been set as the last day on which briefs may be filed by interested companies.

SOUTH DAKOTA.

April: Complaint filed by John W. Steadman against the Beresford (S. D.) Telephone Co. in regard to the right of a telephone company in a town to supply exchange service to residents outside the border of the town.

WASHINGTON.

May 15: Hearing on the valuation of the properties of the Pacific Telephone & Telegraph Co. in the state of Washington. On the valuation to be fixed, as a result of this hearing, telephone rates, both for exchange and toll service, will be based.

WISCONSIN.

April 9: Order granting authority to the La Crosse (Wis.) Telephone Co. to issue $15,000 worth of stock at $50 per share for extensions and additions to its plant.

April 10: Application filed by the Rudolph (Wis.) Telephone Co. for authority to issue $12,500 of stock for extension of lines.

April 13: Hearing in regard to investigation of alleged violation of chapter 610, laws of 1913, by the Union Telephone Co., of Prairie du Chien, Wis. U.—776.

April 14: Hearing in regard to application of the Carter & Wabeno Telephone Co. for permission to increase its rates, tolls and charges. U.—767.

April 14: Order directing that a toll rate of five cents per call (effective May 1) be established on the line between Pewaukee and Merton, and that the Pewaukee-Sussex Telephone Co. and the Merton Telephone Co. shall each retain all tolls for messages originating in their exchanges and going to the exchange of the other company. The Pewaukee-Sussex Telephone Co. is further ordered to immediately proceed to put this line in good condition and maintain it so.

April 15: Hearing in regard to application of the Colfax Telephone Exchange, of Colfax, Wis., for permission to increase its rates, tolls and charges. U.—769.

April 22: Hearing in regard to application of the Jackson (Wis.) Telephone Co. for authority to increase rates. U.—780.

April 23: Hearing in regard to application of the Friendship (Wis.) Telephone Co. for permission to increase rates.

May 13: Hearing at Madison, Wis., on the petition for a revision of Milwaukee telephone rates. The petition was filed in April, 1910, by Peter Bogart and other citizens, and the city joined in the petition a year later. The railroad commission has recently completed a physical valuation of the Wisconsin Telephone Co.'s physical property for a basis upon which to determine rates.

Treatment of Poles and Cross Arms with Preservatives

Cause of Decay of Wood—Penetration of Timbers by Oils—Composition of Preservative—Methods of Applying Treatment—Abstract of Paper Presented at the Annual Convention of the Tri-State Independent Telephone Association.

By J. B. Wilkinson

History teaches us that at as early a date as 400 years B. C., theories were advanced and brought to public notice, on the preservation of timber.

Deterioration of timber by what we term rot or decay is caused by fungus growth. The bacteria or fungi enter the timbers from the outside. As a consequence, it is necessary for the application of a preservative to the outside of the timber to prevent these bugs from entering the wood by destroying them before they have an opportunity to begin their destructive operations. Of course, it is not meant that a treatment, which is not a germicide, alone affecting the outside of a piece of timber, is a preventative of decay. But if we have a means of subjecting this fungus bacteria to a process which will render it harmless, either before it enters the timber or after it has penetrated it, one can readily see that the decay is arrested.

Amount of Penetration.

You will therefore appreciate that it is necessary to prepare the path of entrance of these germs in such a manner that the germs cannot live. You may ask the question, how much penetration of the preservative is necessary to be beneficial and accomplish the result of preserving the wood. By some the question of penetration alone seems to be considered, without due regard to the preservative qualities of the liquid with which the wood is treated. I have seen several samples of timber treated with a so-called wood preservative, where the timber was discolored for a great distance; in fact almost the entire piece of wood showed a discoloration, proving that the penetration was thorough.

It is an easy matter to secure great penetration of wood by different kinds of oils. This can be illustrated by making a mixture, using oils or acids and coloring matter, to show that certain liquids will penetrate to a great distance. But the fact that the timber so treated may show a discoloration, proving that the penetration was complete, does not by any means indicate that the timber treated in this manner will be preserved, because the oil, or so-called preservative which has been absorbed by the wood, if it is a preservative, must be of such a nature that it will not leach out of the wood. As a consequence it must be practically non-volatile and contain valuable preserving qualities, so that it will remain in the timber and at the same time exert a destructive influence on the bacteria or fungi to such an extent that they cannot live where the preservative remains.

It is possible to take, say, kerosene oil and lamp black, turpentine and lamp black or any simple light oil, which carries with it a discoloration and treat a piece of wood and prove conclusively that the timber so treated is thoroughly penetrated, as the wood will show a discoloration in the inner parts when it is cut into or sawed through. But this penetration does not prove anything to us as to the preservation, because we all know that petroleum oil or turpentine oil evaporates very rapidly. After the wood which has been so treated has been exposed for a number of years, a chemical analysis will show that, while the wood may still show a discoloration to possibly a great depth, there will be nothing remaining in the wood from this treatment containing a preserving quality. The question of penetration should, therefore, be liberally considered, and it should be borne in mind that timbers which have been treated and show a thorough penetration, should also show that the substance which has been injected into the timber or has penetrated into it, has a preservative quality.

Another factor that should be considered is the obtaining of a product or substance which does not close the pores of the wood. Frequently timbers, such as cross arms, poles, cross ties, etc., may not be thoroughly seasoned, and if a so-called wood preservative is used in treating them, closing the pores of the wood, such treatment will imprison or seal up the dampness in the wood, thereby causing fermentation. As a result we will eventually have what is termed dry rot.

The preservative must be one that is a germicide and which allows moisture to penetrate the timber through the treated portion, whether it be a thin film or a depth of one inch or more. The fact that the pores are not closed will permit this moisture to evaporate through the same path by which it entered the wood.

Dr. Dean, of Yale University; Dr. Alleman, of Swarthmore College, formerly with the U. S. Forest Service; Dr. Moore, U. S. government chemist; Mr. Harris, chief chemist of the Western Union and Bell companies; Dr. Richardson, chief chemist of the Barber Asphalt Co., and others were expert witnesses in the U. S. customs trials, and every one under oath testified that they considered the high boiling, pure, unadulterated coal tar distillates to be the best for preserving wood. The United States Court of Appeals, in its decision, May 26, 1913, concluded that a high boiling coal tar oil of practically non-volatile qualities was exceptionally of high value when used for the preservation of timbers and wood exposed to the action of weather, moisture and influences which would ordinarily tend to produce decay.

Two Methods of Preserving Timbers.

There are practically two methods of preserving timbers against decay. One method is to fill the pores of the wood with a substance which will prevent the entrance of fungi or wood-destroying bacteria. There is no question but that timbers so treated and thoroughly filled with a substance insoluble in water, if it will remain permanently in the wood and has the proper germ destroying qualities, will preserve the wood. But it has been shown that it is a difficult matter to accomplish this, except at usually a prohibitive cost.

Another method is to use a wood preservative which does not close the pores, but permeates the cell walls of the wood. If this contains the proper germ-destroying properties, such a treatment proves much more valuable than the foregoing method, if the substance which has penetrated the wood remains in the cell walls and has the properties for destroying the germs which may enter with moisture.

History relates that after 3,000 years of perfect preservation, Pettigrew extracted the preservative from the heart of an Egyptian mummy and putrifaction set in immediately. This experiment proves that it was the abiding presence of the antiseptic which prevented decay.

Samuel B. Boulton presented a paper before the Institute of Civil Engineers in England in 1885, and by Mr. Boulton's collection of data and records of experiments and investigations, it was shown conclusively that it was the high boiling coal tar oils that remained in the timber for a period of thirty-two years which preserved it, as all the low boiling oils, which were contained in the tar oil with which the timber had been treated, had evaporated or leached out. This showed that the presence of the antiseptic in the coal tar oil distillates, which remained in the timber, was the cause of these timbers not being attacked by decay producing germs.

U. S. Forest Service Tests.

Similar tests and investigations were made by the United States Forest Service by extracting from timbers the remaining coal tar distillates after the timbers had been exposed to rot for periods up to forty years. Analysis of the oil, which had been extracted, showed that it was a high boiling coal tar distillate which remained in the timber, as these distillates were insoluble in water and practically non-volatile and germicidal.

There are several methods of treating poles and cross arms with wood preservative. One of them is the brush treatment, which is the most convenient, and another is the immersion or dipping treatment. Both are recommended, but of course the dipping treatment is readily seen to be the most efficient. With this method the wood preservative can be heated to the proper temperature. This temperature can be maintained to a constant degree and the pole or cross arm immersed or dipped in the treating tank for a sufficient length of time until the preservative has impregnated the wood to a certain depth.

The proper treatment of poles and cross arms not only prevents decay, but will arrest deterioration caused by rot and decay. The Memphis Telephone Co. reports that in 1904 some of the untreated poles used in the construction of its highly elevated leads had begun to decay. The dirt was excavated from around certain of these poles to a depth of about 18 inches, and one coat of high boiling, pure coal tar distillate was applied. R. H. Polk, general manager of the company, advises that those poles show every evidence of lasting at least ten years longer.

The decay of poles is generally confined, especially at the beginning of deterioration, to a point beginning from 12 to 14 inches above the surface of the ground to a foot and a half to two feet below the surface. Hence in treating the butts of poles, either by dipping them or applying the brush treatment, the preservative should be applied to the pole butts, so that the treated portion will extend 18 inches or more above the ground surface. All crevices and checks should be filled, and in using the brush treatment, the second coat should not be applied until the first coat has been fully absorbed. The gains and tops of the poles should receive two coats of preservative.

Poles exposed to danger from marsh fires, prairie fires and destruction by horses and animals gnawing them, should be treated to a point four, six or eight feet above the ground line.

To get the best results in using a high boiling tar distillate, it should be heated to 150 to 200 degs. Fahr.

In treating cross arms, a convenient method is to use a tank to contain the wood preservative. In high boiling, pure coal tar oil is used. Heat it to a temperature of not less than 200 degs. Fahr., and immerse the cross arms in this liquid. They should remain there from five to eight minutes, the length of time depending upon the density of the timber.

Where wooden anchors are used, as they are expensive to install, it is good economy to treat them before they are buried in the ground.

To secure the best results, all timbers which are to be treated with a wood preservative should be as thoroughly seasoned as possible. It is apparent that the more thoroughly seasoned the timber is, the more readily it responds to the penetration of the preservative.

The larger telephone companies have begun to realize that it is an expensive proposition to replace wood construction, particularly as timber has advanced in price over the value of 10 or 15 years ago. But the actual cost of the timber to be replaced is generally exceeded by the cost of the labor necessary to effect the replacement. If cross arms, poles and exposed woodwork can be treated at a comparatively small cost, and the telephone companies thereby enabled to secure an insurance at less cost than by other means, the question of wood preservation is one that cannot be overlooked.

There is a law compelling the manufacturers of various products, such as foods, liquors, and especially insecticides, to label their packages, stating definitely their component parts. It seems to the author that we, as an association, should endeavor to persuade our congressmen to get a law passed, requiring manufacturers of so-called wood preservatives to label them in such a way that the component parts are printed in plain English. At the present time there is no law compelling the producer of so-called wood preservatives to designate the contents of the product. If it is an advantage for the insecticide to be labeled under the Pure Food and Drug Act, wood preservative, which also may be considered an insecticide, should, in my opinion, be subject to the same restrictions.

Until the government does require manufacturers and dealers of wood preservative to conform to requirements similar to those embodied in the Pure Food and Drug Act, the consumer of wood preservative is able to protect himself by taking advantage of the specifications adopted after diligent research and investigations made by their engineers and chemists, of the New York Dock Department, United States Signal Service, U. S. Navy and the American Telephone & Telegraph Co. It is not difficult to obtain wood preservative which will conform to these specifications, and dealers and manufacturers of the highest grade of preservatives will not hesitate to furnish sworn affidavits that their product conforms to these specifications.

If the cross arm or pole were gifted with the power of speech, no doubt each would say, "Treat me well, and I shall remain with you always."

Elyria Telephone Plant Suffers Damage by Fire.

Over 2,200 telephones and 20 toll lines of the Elyria Telephone Co., of Elyria, Ohio, last Monday were put out of service by a fire of five minutes' duration, which caused a damage of $10,000 to the telephone equipment. Before the metal distributing frame, in which the fire originated, had cooled off a force of switchboard men from the Garford Mfg. Co., was at work removing the 3,600 wires from the main frame, in an endeavor to restore the service as quickly as possible.

By Tuesday afternoon service on all of the 20 toll lines had been restored and all the local telephones were again in service by Thursday evening. These repairs, however, are but temporary as the company has placed an order with the Garford company for a new distributing frame. This frame will be of the latest type and will necessitate the recabling of the entire building when it is installed.

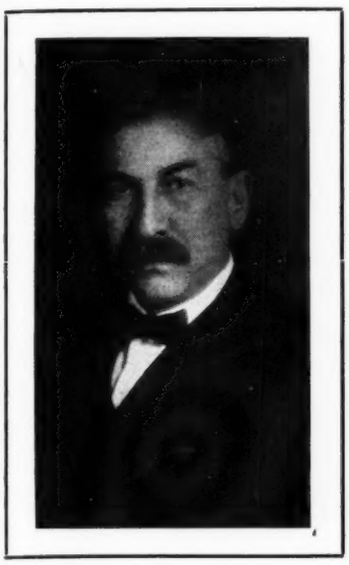
Telephone Bill Killed by Pennsylvania Legislature.

Representative Nissley's bill seeking to require telephone companies to give a ten days' notice in writing before disconecting an instrument and regulating the collecting of telephone rentals in advance, was recently killed by the Pennsylvania legislature.

Opening of New Exchange at Tampa, Fla., Celebrated

Peninsular Telephone Co. Celebrates Cut-Over to Its New Automatic Exchange—A Short History of the Organization and Growth of the Company—Its Strong Competition with the Bell Company, Resulting in Consolidation

Celebrating the opening of the new automatic exchange of the Peninsular Telephone Co., at Tampa, Fla., about 300 guests, including the members of the Rotary Club, attended a banquet given last week by the Peninsular company on the top floor of its new building at Zack and Morgan streets. The banquet hall was artistically decorated for the occasion and a ten-piece orchestra rendered many selections during the evening.



W. G. Brorien.

After a unique and interesting program, in charge of the Rotary Club, had been rendered, W. G. Brorein, president and general manager of the company, was presented with a loving cup as a token of the high esteem in which he is held by the stockholders and directors.

In the ten years following the absorption of the business of the Bell company in Tampa, the Peninsular Telephone Co. experienced a remarkably rapid and steady growth. In the fall of 1913 it was found necessary to increase its facilities to meet the increasing demand for service, and in October of that year the property on which the new building is now situated, was acquired. In July of the following year the first steps were taken toward the construction of the present home of the company. At about the same time a contract was placed with the Automatic Electric Co., of Chicago, for the installation of a full automatic system. The new exchange building, which is a four-story brick and reinforced concrete structure, up-to-date in every detail, was completed last month. On the first floor are located the general offices of the company. The office of General Manager Brorein is located on the second floor, as are also the long distance operating room, the operators' recreation rooms, bedrooms for operators on night duty and the offices of the drafting and accounting departments. The third floor is occupied by the automatic equipment for the local lines, and the men's recreation room and library. The fourth floor is not at present needed by the telephone company, and has been leased as a lodge hall.

The installation of the automatic equipment was begun several weeks ago, and the cut-over from the old manual exchange to the new automatic exchange was made Saturday, April 3, at midnight. The cut-over, it is said, was effected with little trouble, in spite of the fact that the load on Monday, April 5, was unusually heavy. This was due to a fire occurring in Tampa, and also to the numerous inquiries regarding the Willard-Johnson fight. The initial installation consists of 3,350 lines, giving single line, four-party and P. B. X. trunk service. This includes the West Tampa exchange, as well as the new Main exchange. Due to the company's rapid growth in West Tampa a semi-automatic district station was established at this point several years ago, but this station has now been converted to full automatic operation as a part of the general rehabilitation of the company's system. The rural lines and toll pay stations terminate on the second floor of the new Main exchange, and a two-position section for information clerks is associated with the toll board.

The first steps toward the organization of the Peninsular Telephone Co. were taken in 1901. Mr. Brorein came to Tampa from Ohio with a proposition to construct and operate a modern telephone system with up-to-date equipment. At that time the Bell company had exclusive control of the city and was operating about 350 telephones. The service was unsatisfactory and in March, 1901, Mr. Brorein was granted a franchise by the city council. The company was immediately incorporated and completed its organization in the fall. Its first officers were: W. G. Brorein, president; Jacob Haus, vice-president; Guy Huffman, secretary, and George K. Detwiler, treasure. These officers, together with S. A. Hoskins, J. H. Goeke and W. U. Lathrop, formed the board of directors.

In May, 1901, the company began the construction of its underground system, and in the fall of that year began the construction of the toll line system. The first long distance line out of Tampa was that to Bartow, which was begun in October, and placed in service in February of the following year. This was followed by the construction of a toll line to Bradley. At that time there were no telephone exchanges in South Florida, with the exception of those in Tampa and Bradentown. The latter was purchased by the Peninsular company shortly after it commenced operation.

The original plans for the Tampa exchange provided for 700 subscribers, just twice the number of subscribers of the Bell company. But so many applications were received by the new company, that it altered its plans and prepared for 1,000 subscribers. With practically the full capacity of the board taken the company commenced operations in October, 1902.

For several years the Peninsular Telephone Co. and the Bell company were in strong competition, and both lost money. In 1905, owing to the financial situation, negotiations were begun with the Bell company looking toward the consolidation of the two exchanges. The result was that the Bell exchange was purchased by the new company, and by the first of 1906 the Bell company had left the Tampa territory altogether. Following the absorption of the Bell company, an application was made by the Peninsular company to the city council for permission to charge a rate which would produce a reasonable return on the investment, and in December, 1905, the increase was granted.

At the time of the consolidation the Peninsular exchange had 1,700 subscribers, and the Bell, 900. Since that time the company's growth has been steady and rapid, amounting to nearly 20 per cent. per year. So rapid were the increased demands on the company that for several years it was taxed to the limit of its financial resources constructing new lines. At that time the company consisted of six or eight persons of limited capital, who had already invested

all they could afford, and there was considerable difficulty in interesting other capital. In the fall of 1913, however, the company was able to dispose of a large block of securities to Coggeshall & Hix, of New York, thus obtaining the ready money so badly needed to carry out its improvement plans. Accordingly, plans were prepared and contracts let for the new exchange and equipment which was recently cut into operation.

New Building of the Peninsular Telephone Co., Tampa, Fla.

The company's latest directory, issued in March, shows that it has a total of 9,769 stations in its entire system. The various exchanges and their respective number of subscribers are as follows: Tampa, 5,533 telephones; Bradentown, 769; Palmetto, 416; Sarasota, 318; Bartow, 425; Lakeland, 846; Plant City, 459; Port Tampa City, 90; Clearwater, 483; Tarpon Springs, 226, and Mulberry, 114 telephones. The company also has a total of 100 toll stations. It operates 900 miles of metallic long distance toll lines in South Florida, and is connected with all points in Georgia, Alabama, Florida, North and South Carolina.

Telephone Employes, Their Salaries and Wages.

For the United States census on telephones for 1912, all companies and systems, having annual incomes of $5,000 or more, were required to report the numbers of the several classes of employes on their rolls on September 16, 1912, together with the amount of salaries or wages paid each class during the year. If the data for September 16 were not available, they were required to report the number for the nearest representative date.

All regular officers and employes, whether engaged in operation, maintenance, canvassing, or collecting, or otherwise employed, were included. If any persons were employed only a portion of the time in the telephone service, the report was to include only the wages paid in connection with that service. The general superintendents or other heads of departments, if considered as salaried officials of corporations, were reported as such, but employes engaged exclusively in additions or extensions to the systems were not included. Overseers and foremen performing work similar to that done by men over whom they had charge, were included with wage earners, but those whose duties were wholly supervisory were reported as salaried employes. The statistics are summarized in the accompanying table.

The totals for 1902 shown in this table are not strictly comparable with those for 1907 and 1912, because they include the employes of systems having annual incomes of less than $5,000. It is believed, however, that the number thus included is not large enough to have a perceptible effect upon the percentages of increase. There were 183,361 salaried and other persons employed by the telephone systems of the United States during 1912, an increase of 132.8 per cent. over the number reported for 1902. Amounts paid annually in salaries and wages increased from $36,255,621 in 1902, to $96,040,541 in 1912, or 164.9 per cent. During the same period the number of operators increased from 39,858 to 96,332, or 141.7 per cent., and the wages paid to them during the year from $10,765,098 to $32,474,093, or 201.7 per cent.

The increase in the number of female operators, and in the wages paid, is noteworthy. In 1902 there were but 37,333 women employed as operators; in 1912 there were 94,360, an increase of 152.8 per cent. During the same period the wages paid this class of operators increased from $10,035,432 to $31,603,432, or 214.9 per cent. The proportionate increase in wages, therefore, was greater by 62.1 per cent. than the increase in the number employed. The number of male operators has decreased at each census, and in 1912 it formed but 2 per cent. of the total number of operators.

Case Heard and Decision Rendered by Telephone.

Police Judge Austin, of Toledo, Ohio, recently held a "telephone court," which resulted in the fining of two automobile speeders. The offenders who live at Rossford, Ohio, were recently arrested by a motor patrolman for speeding on Broadway. They were instructed to appear in court at a certain hour. Neither wished to lose time so they called up the judge by telephone. A hasty court was called by the judge between the courses of his dinner. The speeders pleaded guilty and the judge pronounced his sentence—all over the telephone.

	1912	1907	1902	Percent of increase* 1902-1912	1907-1912	1902-1907
Employes, total.						
Number	†183,361	131,670	78,752	132.8	39.3	67.2
Salaries and wages	$96,040,541	$65,009,349	$36,255,621	164.9	47.7	79.3
Salaried employes						
Number	38,753	22,819	14,124	174.4	69.8	61.6
Salaries	$32,681,482	$18,542,619	$ 9,885,886	230.6	76.2	87.6
Wage earners.						
Total average number	144,608	108,851	64,628	123.8	32.8	68.4
Total wages	$63,359,059	$46,466,730	$26,369,735	140.3	36.4	76.2
Operators						
Average number	96,332	72,518	39,858	141.7	32.8	81.9
Wages	$32,474,093	$22,636,671	$10,765,098	201.7	43.5	110.3
Men						
Average number	1,972	2,457	2,525	—21.9	—19.7	—2.7
Wages	$ 870,611	$ 942,455	$ 729,666	19.3	—7.6	29.2
Per cent. of total operators	2.0	3.4	6.3	.....	.....	.....
Women						
Average number	94,360	70,061	37,333	152.8	34.7	87.7
Wages	$31,603,422	$21,694,216	$10,035,432	214.9	45.7	116.2
Per cent. of total operators	98.0	96.6	93.7	.....	.....	.....
All other wage earners						
Average number	48,276	36,333	24,770	94.9	32.9	46.7
Wages	$30,884,966	$23,830,059	$15,604,637	97.9	29.6	52.7

*A minus sign (—) denotes decrease. †Number employed September 16, 1912.

Comparative Table of Telephone Employes, Salaries, and Wages Reported by Companies Having an Annual Income of $5,000 or More.

From Factory and Salesroom

Convention: Florida, Tallahassee, April 22, 23; Tri-State, Memphis, Tenn., May 21, 22

Exhibit of the Garford Mfg. Co. at Harrisburg, Pa.

The Garford Mfg. Co., of Elyria, Ohio, reports that its exhibit at the joint convention of the Eastern and Western Pennsylvania Independent telephone associations, held last week at Harrisburg, Pa., was a splendid success, not only in attendance but also from a business point of view. An interesting feature of the exhibit was a practical circuit demonstration of the Garford automatic switchboard features for common battery manual multiple switchboards. The complete line of Garford magneto and common battery apparatus also attracted considerable attention among the telephone men present.

The exhibit was in charge of Rube Davis, Pennsylvania representative of the company, and Frank Slough, who were kept busy renewing acquaintances and extolling the merits of Garford equipment. At the banquet the company's representatives distributed novel and attractive souvenirs.

Service Organization of the MacGillis & Gibbs Co.

Service is the word which has been selected as emblematic of the firm name, MacGillis & Gibbs Co., of Milwaukee, Wis. The company bases its claim for the use of this word upon its plan of organization for service, and its facilities. Engaged for over 15 years in producing cedar lumber, including posts, poles, ties, and shingles, the company is in position to maintain its service ideal.

Its largest yard is at Gladstone, Mich., which is located in the center of the Northern Michigan white cedar producing territory, and is a distributing point on the Soo Line. These factors enable the company to ship promptly and freely by rail. Large quantities of timber are also shipped by water. The company handles, it is said, on an average of 1,000,000 pieces of white cedar through this yard each year. The yard has a large area, but the company's six separate loading tracks afford a great loading capacity.

The company also has yards at Duluth, Minn., one of the largest railroad centers of the Northwest. An abundance of cars is available here on short notice. Located on the shores of Lake Superior, shipment can also be made from the Duluth yards by water.

Its yard at Remer, Minn., is in the heart of the white cedar swamps of Northern Minnesota. The town of Remer is also located on the Soo Line, thus insuring prompt shipment.

In addition to Northern white cedar the company produces large quantities of Western red cedar poles from its own timber in the vicinity of Sand Point, Idaho. A full assortment is always in stock, especially the longer length poles.

Cedar Ready for Shipment, in Duluth Yards.

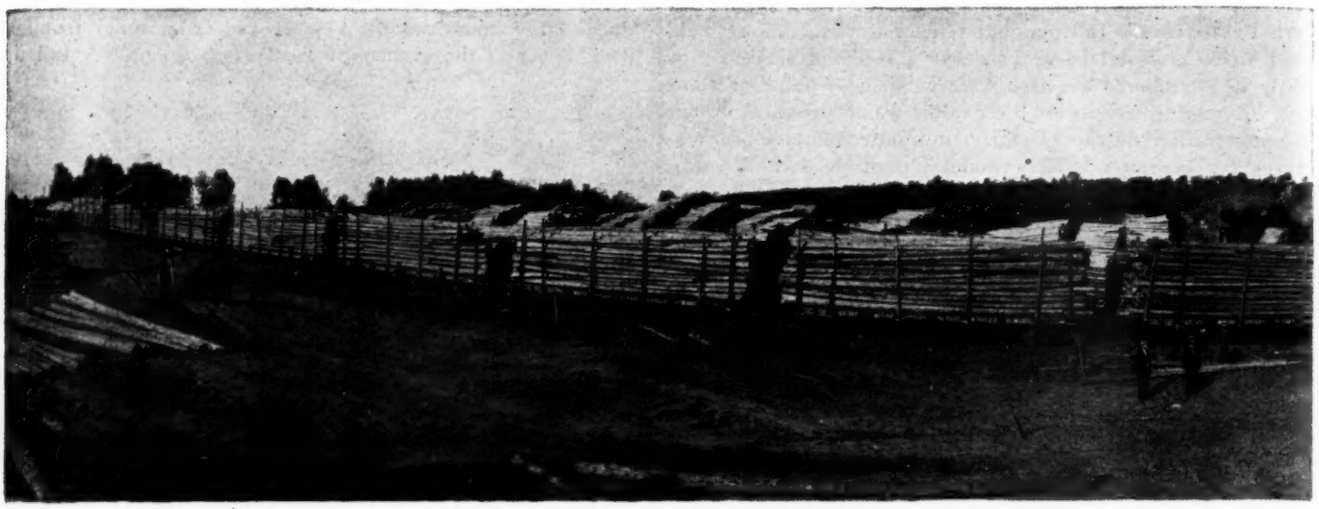
The general offices of the MacGillis & Gibbs Co. are at Milwaukee, Wis., and branch offices are maintained at Minneapolis, Minn., and Chicago. The company's staff is thus enabled to personally look after the tracing of delayed shipments.

In harmony with its plan for service, the company employs woods' superintendents, whose sole duty it is to oversee the production and manufacture of its timber. From years of experience, the company has found it impractical to render good service from woods' landings or spurs. The cedar is, therefore, assembled at its permanent concentrating yards. By this manner of assembling its stock the company has a full and complete assortment of sizes on hand at all times. The stocks shipped from woods' landings must necessarily be shipped out quickly to make room for the next season's production. This often results in partially seasoned or green stock, which it is said is more expensive to prepare and set and has shorter life than stock that has been properly seasoned. By assembling its stock at its

Poles in Duluth Yards Are Sorted Upon Receipt So That Various Sizes Are Easily Available for Prompt Shipment.

permanent yards the timber is kept until thoroughly seasoned.

Incoming shipments do not interfere with outgoing material, as the company has an abundance of room in its yards. The sorting, grading and loading is done by men experienced in the pole business and familiar with the company's standard of quality. As shown in the accompanying illustrations, the poles are all carefully graded and sorted into piles when received, thus no delay arises when making shipments.



Part of a Trainload of Poles Received at the Gladstone, Michigan, Yards, Note Abundant Sorting Ground and Track Facilities.

Reorganization of the U. S. Light & Heating Co.

The receivers of the United States Light & Heating Co., of Niagara Falls, N. Y., have announced that a complete reorganization of the company is now assured through the efforts of the stockholders' protective committee. It appears that the committee represents over $2,000,000 of the $2,500,000 outstanding preferred stock and about $6,000,000 common stock, giving it the majority control.

As the necessary notification of the stockholders and others concerned will take some time, it appears, therefore, that the receivership will be discontinued some time in June. In the meantime, the business will be conducted without interruption under the same operating management as heretofore, and the prospects for a large volume of business seem unusually bright. The receivership, it is stated, was instituted at a time of greatest business depression, during July of last year, and has continued successfully even despite the adverse circumstances of receivership and the war abroad. The company has made a showing that has been regarded as remarkable.

The mammoth plant at Niagara Falls has been doing a larger volume of business during the month of March than for a year past, and orders booked for future deliveries are considered satisfactory. With the future of the company now assured, there will be a larger increase of orders that have been pending for some time past on account of the uncertainty in connection with the destinies of the company.

The receivers of the company are James A. Roberts, of New York City; James O. Moore, of Buffalo, and J. Allan Smith, of Niagara Falls, N. Y.

Garford Enjoys Good Business on Magneto Equipment.

The Garford Mfg. Co. of Elyria, Ohio, has just closed a contract through its Kansas City Branch, for furnishing a complete magneto telephone equipment and distributing frame to the Kiron Telephone Co., of Kiron, Iowa.

The buying committee of the Kiron company visited various exchanges in its territory, inspecting different makes of equipment before coming to a decision. As a result the company placed the order with the Garford company for its equipment.

The Kiron company is one of the early Independent telephone organizations and under the efficient management of Ed Moline, has experienced a healthy growth.

The Garford company reports that it is enjoying splendid business on magneto exchange equipment, switchboards, and telephones, especially so through the Western territory. The company is well situated to take care of such business by reason of having a large distributing branch at Kansas City where a complete stock is carried and from which point it makes prompt shipment.

Kellogg Exhibit at the North Dakota Convention.

At the ninth annual convention of the North Dakota Telephone Association, held recently in Grand Forks, the large panel displays which were shown by the Kellogg Switchboard & Supply Co., of Chicago, attracted considerable attention.

One which was particularly interesting was the folding panel display which showed the consecutive steps in the manufacture of parts such as the transmitter head, or the receiver cup—almost a trip through the factory.

Much enthusiasm was expressed in regard to the Kellogg "new type" compact magneto telephone. "Why were they ever built so large?" was the oft-repeated comment.

B. A. Parsons, Kellogg representative in the states of North and South Dakota, was in charge of the exhibit.

Standard Underground Exhibit in San Francisco.

The Standard Underground Cable Co., of Pittsburgh, Pa., has just issued a 20-page booklet containing the story of its exhibit at the Panama-Pacific International Exposition and a short history of the company's activities. On the front cover are illustrations showing the stringing of aerial cable in tropical countries and the laying of underground cable in the business section of a city.

The company began the manufacture of underground electric cable 33 years ago in February, the month in which the exposition at San Francisco was opened to the public. The founder of the company was Richard Waring, inventor of the "Waring" cables. It is said that this was the first company in the United States established for the manufacture of lead covered underground cables. The first cable works established by the company were in Pittsburgh but in 1900 a moderate size plant was built in Oakland, Cal., just across the bay from San Francisco. In the following year a third and much larger plant than either of the other two was established at Perth Amboy

N. J. Both the Pittsburgh and Perth Amboy plants have been greatly enlarged from time to time during the past 15 years to take care of the rapidly increasing business. The company now has three plants all in active operation and equipped with the most up-to-date facilities for the manufacture of electric wires and cables of all kinds, photographs of which are shown in the booklet.

In its exhibit at the exposition the company has endeavored to give some idea of the raw materials and manufacturing processes involved in the production of the various types of electrical conductors. Various raw products are shown, as are also several machines used in the manufacture of different kinds of wire. In the show cases and on racks and tables are shown representative samples of bare and insulated wires and cables, braided, lead covered and armored. Cable junction boxes and cable terminals are also displayed.

The company urges those visiting the exposition to make a thoughtful inspection of its display in the Palace of Machinery, Block No. 22.

Equipment of the North State Telephone Co.

A. S. Hallstrom, Southern representative of the Kellogg Switchboard & Supply Co., writes: "You will recall my having written regarding the automatic ringing, listening and instantaneous recall equipment installed by the North State Telephone Co. of High Point, N. C. This apparatus has been in service six months and is working to perfection. Where it was necessary, heretofore, to use six local operators during the entire day and one additional during the busy hours, it is now only necessary to use three during the day, and a 'relief' to come to the aid of the three during the busy hours.

"The average number of calls per hour at the busy time is about 278 per operator. This equipment was installed by Mr. Hayden, on a series multiple jack cut-off switchboard. The service here is greatly improved at a reduced cost. Patrons and operators are much pleased. The necessary cord circuit relays are mounted on separate relay racks on the top of sections and really do not present an unsightly addition.

Upon completion of the installation, Mr. Hayden mailed out the following description of the system. You will note that it is written in a strictly non-technical way—purposely so for the benefit of the subscribers:

'The telephone in its relation to the public may be considered the most vital element of our social and commercial development.

There are various methods of connecting two telephone stations together for the purpose of conversation.

Realizing that the most rapid and reliable method of establishing connection is contributory to satisfying the subscriber, we, after full investigation, have installed a system with the following new accomplishments: Automatic listening, automatic ringing with indication, instantaneous recall, secret service, automatic peg count, etc.

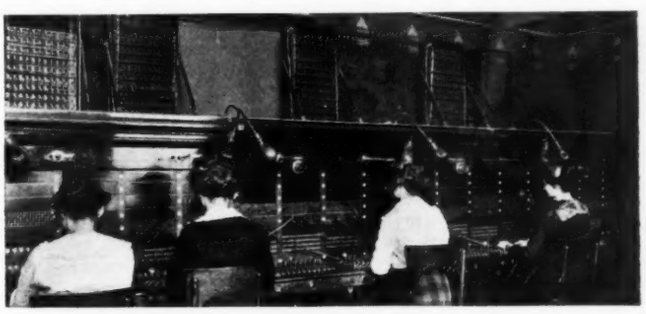
This system is different. Read these instructions carefully so you can get the full benefit of the new improvements. Remember, the operator only connects you with the number you call. The automatic devices then do the ringing and watch your every want with unerring precision.

The instant you lift your receiver from the hook, an electric light, with your number on it, shows up at the switchboard. Anyone of three or more operators can answer the call. The first operator who takes up your call, is automatically connected with your line and takes your order. When she connects you with the number you have called, she is automatically cut out. The advantages of this automatic listening feature are: First, the operator cannot take up your call until she is ready to wait on you, thus giving some idle operator a chance to take the call. Second, the operator taking your call can serve you more quickly, as it is no longer necessary to operate a number of keys by hand. Third, the operator cannot leave you until she has connected you with the number you have called, and there is no possibility of your call being neglected. Do not work the receiver hook a number of times nor ask the operator questions. Both of these practices result in a loss of your time and also impede the service. When you call the operator, ask for some number, for the chief operator, for long distance, or for time of day. For any other information ask for the information operator.

Secret Service: The operator has no listening key and therefore cannot listen to your conversation in the usual way.

Automatic Ringing: As soon as you are connected with the line you have called, if this line is not busy, your party's bell will ring. If it is not answered promptly, it will ring again, and continue to ring, one second out of every nine, until it is answered. You will distinctly hear every ring in your own receiver. When you are satisfied that the bell has rung sufficiently, you can hang up or make a recall for another number. The great advantage in this machine ringing and automatic indication is that the operator is not involved, but that you alone have absolute control of the ringing. Without the least effort, you ring the party you are calling, as long as you please. Another advantage is that you will get quicker responses, because in every case the bell is rung correctly. It is also a great relief not to be annoyed by the operator coming in on the line and asking about ringing again. In this system, the operator has nothing whatever to do with the ringing. The machine is so constructed that it will not ring in on a busy line, nor in one's ear. The best of operators often make mistakes in ringing and it is very satisfying to know that there is no danger of being 'shot' in the ear with the ringing current.

The instantaneous recall is the most valuable feature of the new service. It entirely does away with all working of the receiver hook and delay in making a number of calls in succession. After you have called one party and wish to call another, depress the hook once and release it instantly, and the operator will answer without fail. If you have answered your telephone and find that another party at your place is wanted, hang up the receiver and send the desired party to the telephone. He will find that the connection has not been disturbed, provided the calling party is waiting. If you have answered your telephone and wish to make a new call immediately, it is only necessary to have the party who called you hang up his receiver, as the calling party controls the connection.'"



Switchboard of the North State Telephone Co.

Great Northern Railway to Install Automatic System.

The Great Northern Railway Co. recently contracted with the People's Telephone Co., of Superior, Wis., for the installation of a complete automatic telephone system in the Great Northern Railway and the Great Northern Express companies' offices in the cities of Superior, St. Paul and Minneapolis. When installed the company will have a complete inter-communicating automatic telephone system in and between the cities named. Forty-five automatic telephones will take care of the Great Northern Railway's current requirements in Superior, the automatic switchboard to be located in its railway office building at that point. The work will begin at once.

The ultimate capacity of the system will be 1,000 telephones each in St. Paul and Minneapolis, and 500 in Superior. All subscribers of the Tri-State Telephone & Telegraph Co. of St. Paul, using the present system can then reach any telephone on the Great Northern Railway's automatic system through the Tri-state company's various exchanges.

It is estimated by company officials that the speeding up of telephone service upon the adoption of this automatic system will mean a huge saving in dollars and cents every year to the railway, and more than double the efficiency of its telephone system. This is in line with what has been done by other large railroad systems, in the new Kansas City terminal, in the Michigan Central terminal at Detroit, in the Louisville & Nashville terminal at Louisville, and in the Erie Railroad terminal at Buffalo, in all of which automatic telephone service has proven a great success.

Amherst (Neb.) Company Orders Garford Equipment.

The Amherst Telephone Co., of Amherst, Neb., has placed a contract with the Garford Mfg. Co., of Elyria, Ohio, through its Kansas City branch, for new central office equipment. A competitive contest was held in Amherst and after a complete investigation had been made, the Garford company was awarded the contract.

Plymouth, Ill., Telephone System to be Rebuilt.

The Home Electric Construction Co., of Macomb, Ill., recently secured the contract for rebuilding the telephone system of the Mutual Telephone Co., at Plymouth, Ill. Work has already been started.

Paragraphs.

THE NAUGLE POLE & TIE CO. has moved its Chicago offices from 5 South Wabash avenue to 59 East Madison street.

THE STENTOR ELECTRIC MFG. CO., INC., formerly of 1790 Broadway, New York, has announced that the great increase in its business has necessitated the company's moving into larger quarters. The new address is 126 Fifth avenue, corner of Eighteenth street.

A. G. SHAVER, secretary and treasurer of the Hallett Iron Works, Chicago, recently resigned his position with that company and has opened offices at 1640 Transportation Building, where he will pursue his vocation as consulting engineer. Mr. Shaver's many friends undoubtedly will be pleased to hear of his new activities.

THE CARBO STEEL POST CO., of Chicago, has just broken ground for a new plant at Cambridge, Ohio. This speaks well for the merits of its products, which consist of steel posts and poles for all purposes, also anchors and augers of various kinds. It also has a factory in Chicago Heights, Ill., while its main offices are in Chicago.

THE STANDARD UNDERGROUND CABLE CO., of Pittsburgh, Pa., has issued Bulletin No. 201-1 containing specifications for hard drawn 40 per cent. colonial copper clad wire. Copies of this bulletin, together with detailed information, samples, estimates or prices may be obtained from any of the company's offices.

Legal Cases and Decisions

By A. H. McMillan

Use of Denatured Alcohol.

Two little boys, aged nine and seven, found a bottle of denatured alcohol lying on a culvert at the side of the road and within the bounds of a highway. The bottle had been left there by the workmen of a telephone company. The boys took it home, poured some the alcohol on the ground and then set fire to it. One of the children was burned. Suit was brought against the telephone company for damages in leaving the bottle in the highway. A verdict for the plaintiff was brought in by the jury.

The court held this verdict proper. He said that the parents of the child could not be held to be guilty of contributory negligence in leaving matches within reach of the child. Hall vs. New York Telephone Co., 144 New York State, 322.

Use of Circuit Breakers.

In an action for injuries to a lineman, alleged to have been caused by coming in contact with a charged span wire, leading from the pole, the lineman alleged that the company negligently permitted the span wire to be attached to the pole without a proper circuit breaker, or breakers thereon. It was held that there was evidence to sustain the allegation that the span wire was not equipped with the circuit breaker, and also that it was not equipped with a proper circuit breaker.

It was shown that the company had failed to furnish the lineman with a suitable place to work. It had permitted the span wire to remain in close contact with a telephone wire, so as to render it liable to be heavily charged with a high voltage current, thus rendering it almost a physical impossibility for one to perform the service required of the lineman without being injured. It was also shown that, to one looking at the pole from the ground, the insulation appeared good. It was held that the lineman did not assume the risk as a matter of law. Heckert vs. Central District Printing & Telegraph Co., 218 Federal, 29.

Uninsulated Power Wires.

Where a power company negligently allowed its wires to remain uninsulated and the current passed from them into a telephone wire, the power company is held liable for the death of one killed by the current in attempting to use the telephone, the purveyors of electricity being cognizant of its dangers and propensities, and being bound to anticipate the reasonable and probable consequence of their neglect. So held the Kentucky Court of Appeals in a recent case.

The circumstances were that a man, while attempting to use the telephone in the office at the fair grounds in Paducah, was shocked and killed by an electric current that passed from the heavily charged electric wire of the light and power company to the wire of the telephone company, both wires being attached to the same pole. Paducah Light & Power Co. vs. Partmans, Administrator, 160 Southwestern, 931.

Trap for Children.

A suit was brought in which the following facts were alleged: The agents of two telephone companies, while engaged in repairing their lines of wire, placed a large chest in a certain warehouse. The chest was so constructed as to constitute a dangerous trap when it was left with the lid raised. The lid was heavy and had a small chain attached to it to prevent it from getting much beyond a perpendicular position when opened.

The warehouse was located on the side of a public street, in a town near a railway station, the postoffice, a schoolhouse and the residence of citizens. The warehouse did not belong to the telephone company. On a certain day the telephone agents went away from the building, leaving the lid of the chest raised and the door of the warehouse open. A child between two and three years of age, whose father owned the warehouse, saw the door open and the lid up, and was attracted thereby.

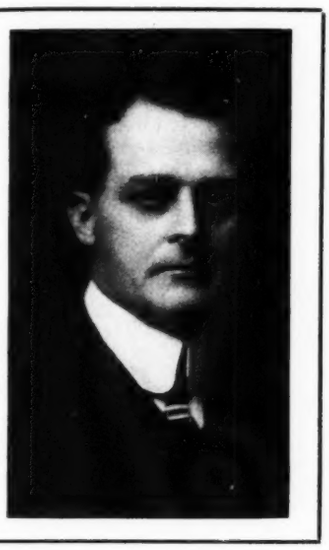
In seeking to investigate according to the natural instincts of a child, he pushed the chain, and the lid fell upon him, injuring him. He was incapable of exercising care for his own safety, and the injury resulted from the negligence of the company's employes in leaving the lid of the chest open and in a dangerous condition. Under the circumstances it was held that a case for damages had been properly stated. American Telephone & Telegraph Co. vs. Murden, 80 Southeastern, 788.

Condensed News Reports

Officers of Companies Are Urgently Requested to Forward to Us Promptly All Financial and Other Statements as Soon as Issued and Any Items of Interest as to Their Plants and Systems

Personal.

JOHN BAYLESS EARLE, president of the Texas Telephone Co., of Waco, was married April 10 to Mrs. Louise Madden Brown. Mr. Earle entered the telephone business in 1899, being then a practicing lawyer. In the fall of 1900 he was made general manager of the Texas Telephone Co. and the Home Telephone Co. of Waco, continuing in that capacity until May, 1912, when he was elected president. He was also, for several years, receiver and general manager of the South Texas Telephone Co., and has been a director of the Ellis County Telephone Co. since its formation in 1902. He also organized the Brazos Valley Telephone Co., which was recently taken over by the Texas Telephone Co.



J. B. Earle.

Mr. Earle was born in Waco and educated at Baylor and the State universities. He is at the present time active in Independent telephone affairs, being a director of the National Independent Telephone Association and a former president of the Texas Independent Telephone Association.

The bride recently came to Waco from Nashville, Tenn., residing at the home of her sister, Mrs. W. V. Fort, at whose home the wedding took place. The bride was attended by her sister and the groom by his life-long friend and present business associate, Ben C. Hyde, of Kansas City, vice-president of the Texas Telephone Co.

Mr. and Mrs. Earle left Waco shortly after the ceremony took place for New Orleans, from which place they will sail for Panama, returning to the States, via Cuba and Jamaica.

TELEPHONY joins with Mr. Earle's many friends in the Independent field in extending their congratulations and best wishes.

C. S. PEYTON, of Fort Worth, Texas, has been appointed manager of the Cameron, Texas, exchange of the Southwestern Telegraph & Telephone Co.

GEORGE GILLIAT has been named general manager of the Pike County Telephone Co., with headquarters at Petersburg, Ind., to succeed C. H. Webb, resigned.

R. Y. WILLIAM, for the past three years manager and lessee of the Big Timber Home Telephone Co., of Big Timber, Mont., has purchased the system from J. A. Bates.

JOHN F. BRUNER has purchased the Mt. Ayr Telephone Exchange, of Mt. Ayr, Ind., from Dr. J. W. Merry. His son, Earl Bruner, will take active charge of the plant.

FRANK LONG, formerly associated with the Pioneer Telephone & Telegraph Co., has purchased the properties of the Marshall Telephone Co., Marshall, Okla., from B. W. Murphy.

E. BRAUSE and F. J. ZIMMERMAN have purchased a controlling interest in the People's Mutual Telephone Co., operating exchanges at Burkett, Mentone, Big Foot and Silver Lake, Ind.

JOSEPH TAYLOR, for several years special agent for the United Telephone & Telegraph Co., at Chester, Pa., has been appointed division manager of the Schuylkill division, with offices in Norristown.

W. G. SEATH, chief clerk to the district manager of the Missouri & Kansas Telephone Co., has been promoted to the office of manager of the Springfield, Mo., exchange. Mr. Porter, being relieved of those duties, will spend the major portion of his time traveling over his territory.

EDMOND LAND, who has acted as chief engineer and manager of the Home Telephone Co., of Jacksonville, Fla., since work first began in connection with the installation of the automatic system, was recently tendered a farewell banquet by the employes of the company as a means of showing their interest and high regard. Mr. Land has assumed charge of the Automatic Telephone Co., of Key West, where he will superintend the installation of the automatic system in that city.

Obituary.

E. D. GRAHAM, general manager and treasurer of the La Fayette Telephone Co., of Lexington, Mo., died recently at Mexico, Mo., of paralysis. Mr. Graham installed the first telephone system in Mexico in 1893 and was also at one time mayor of the city.

CHARLES A. PETERSON, for the past 15 years secretary and general manager of the Delaware County Telephone Co., of Manchester, Iowa, passed away recently at his home in Manchester, after a long illness, at the age of 57 years. Mr. Peterson was born in La Porte county, Ind., in 1858. At the age of 17 he came to Manchester with his parents, entering the employ of a large mercantile firm there, in whose service he remained for many years. In 1900 he became secretary and general manager of the Delaware County Telephone Co., which, it is said, owes everything to his energy and executive ability.

New Companies and Incorporations.

POTTSVILLE, ARK.—The Pottsville Telephone Co. has filed articles of incorporation with the secretary of state with a capital stock of $500. The incorporators are J. A. Backley and J. P. Prior.

DINGUS, KY.—The Williams Creek Telephone Co. has been incorporated recently with a capital stock of $520. The incorporators are R. D. Sparks, M. Williams, J. W. Bailey and others.

ROCKDALE, KY.—The Buckwood & Rockdale Telephone Co. has been organized with a capital of $1,100 by the following incorporators: B. F. Wiley, D. B. Watson and W. B. Glass.

BENCHLAND, MONT.—The Benchland Telephone Co. has been organized by W. O. Bullum, F. J. Gary and G. C. Spratt. The capital stock is $10,000.

POWDERVILLE, MONT.—The Powder River Telephone Co. has been incorporated recently by E. H. Carr, A. Campbell and H. E. Harris. The capital stock of the company is $10,000.

WYNDMERE, N. D.—Articles of incorporation have been filed with the secretary of state by the Antelope Homestead Rural Telephone Co. to operate a line through Danton, Homestead and Antelope townships.

FRYBURG, N. D.—The Fryburg Farmers' Co-operative Telephone Co. has been incorporated with a capital stock of $5,000 by A. H. Anderson, Emil Strand, H. M. Engelharten, Alex Monty and J. A. Frank.

SANGER, N. D.—The Sanger Co-operative Telephone Co. has been organized to construct a telephone line through Oliver county, with a capital stock of $3,025. J. E. Hayes, M. C. Smith and G. E. Digby are the directors.

BATAVIA, OHIO.—The Farmers' Mutual Telephone Co. has been organized and the officers have been elected as follows: President, Wm. Hunt; vice-president, C. Smith; secretary, Harry Whitmore; treasurer, L. A. Peebler.

URBANA, OHIO.—The Urbana Telephone Co. has recently filed articles of incorporation with the secretary of state, the capital stock being $10,000.

WAYNOKA, OKLA.—The Farmers' Mutual Telephone Co. was organized recently by S. B. Boswell, A. R. Woolley and E. L. Cooley.

BENTON, TENN.—The Benton Telephone Co. has been organized recently with a capital stock of $2,500. The officers of the company are: R. M. Copeland, president; S. B. McClary, secretary-treasurer.

OFFUTT, TENN.—The Buffalo & Offutt Telephone Co. has recently been incorporated with a capital stock of $600, by the following: W. G. Wells, W. R. Castle, Wm. Preston and others.

SMITHVILLE, TENN.—The Keltonburg Telephone Co. has received a charter to construct and operate a telephone system with $100,000 capital stock. The stockholders are V. V. Adcock, Thomas Reynolds, W. Cantrell, R. R. Goodson and I. C. Jones.

LA FERIA, TEX.—The La Feria Telephone Co. has recently

been chartered with a capital stock of $1,500. The incorporators are J. A. George, G. W. Dunlap and W. W. Peters.

BAYFIELD, WIS.—A telephone company has been organized to construct a telephone line from Madeline island to Bayfield. The officers of the company are: C. Gilbert, president; J. E. Bissell, vice-president; W. S. Johnson, secretary-treasurer.

DOERING, WIS.—The Doering Telephone Co. filed articles of incorporation recently with a capital stock of $5,000. The incorporators are R. H. Krueger, R. Parent and J. Miller.

MADGE, WIS.—The Long Lake Telephone Co. has recently been incorporated with a capital stock of $1,500 by the following: M. Todd, C. Cipro and R. Donaldson.

MARKESAN, WIS.—The Grand River Telephone Co. has incorporated with a capital stock of $10,000 to construct and operate telephone lines in Green Lake, Columbia and Marquette counties. The incorporators are H. A. Price, M. H. Groswell and C. F. Schrader.

MERRILL, WIS.—The Range Telephone Co. has recently been organized and the following officers elected: President, R. Nutter; vice-president, Wm. Eggers; secretary-treasurer, R. Fenske.

WASHBURN, WIS.—The Bayview Telephone Co. has been organized by the farmers in the vicinity, with Wm. Daly as president, and A. J. Fraser, secretary-treasurer.

Construction.

SOUTH BEND, IND.—The Home Telephone & Telegraph Co. intends to expend $700,000 in improving its system.

BLOOMINGTON, ILL.—The Illinois Public Utilities Commission has granted the National Telephone Co. the authority to issue $100,000 worth of 6 per cent. bonds for the reconstruction of the entire system, including a new switchboard, instruments, cable system for carrying wires and the placing of all wires underground in the business district.

FAYETTE, IOWA.—The Inter-State Telephone Co. is making arrangements to rebuild its exchange at this place this spring.

LAKEVIEW, IOWA.—The Farmers' Telephone Co. intends to construct new lines in this vicinity.

LEXINGTON, KY.—The Fayette Home Telephone Co. will reconstruct and extend its telephone system.

WHITESBURG, KY.—The Whitesburg Telephone Co. plans to extend its system to Hazard via Blackley, Viper and Lothair.

MUSKEGON, MICH.—The United Home Telephone Co. will spend $200,000 on improvements in the near future.

NEW ULM, MINN.—At a recent directors' meeting of the New Ulm Rural Telephone Co. it was decided to erect a new exchange building.

FAIRMOUNT, MINN.—The Fairmount Telephone Co. is planning to erect a new two-story exchange and office building.

SPRINGFIELD, MINN.—Arrangements are being made by the Farmers' & Citizens' Telephone Co. to extend its lines into Leavenworth.

CANTON, OHIO.—The Ohio State Telephone Co. is planning improvements in the entire state to the extent of $1,500,000.

HOWARD, S. D.—The Nanson Telephone Co. is planning to construct a telephone line between here and Winfred.

RICEVILLE, TENN.—The Riceville Telephone Co. plans to construct a line to connect with the Cumberland system at Athens, Tenn.

WASHBURN, WIS.—The Bayfield County Telephone Co. is planning to rebuild its entire system this year.

Elections.

ST. AUGUSTINE, ILL.—The St. Augustine Telephone Co. held its annual election recently with the following results: President, P. H. Tanney; secretary, G. L. Hagan; treasurer, G. W. Davis.

CAMDEN, IND.—The Camden Co-Operative Telephone Co. met recently and elected the following officers: President, E. M. Cripe; vice-president, M. Wilson; secretary, U. E. Tesh; treasurer, E. C. Rice; manager, M. Martin.

ELKHART, IND.—At the annual meeting of the stockholders of the Home Telephone Co. officers for the coming year were elected as follows: President, I. W. Short; vice-president, H. B. Sykes; secretary, W. L. Shoots.

ELLETTSVILLE, IND.—The Farmers' Free Co-Operative Telephone Co. recently held its annual election with the following results: President, C. A. Allen; secretary, C. Freeman; treasurer, D. Headdy; directors, C. E. Grant, Riley May and C. Allen, together with the officers.

ROSEDALE, IND.—The stockholders of the Rosedale Mutual Telephone Co. have elected the following officers for the ensuing year: President, J. R. Mitchell; vice-president, Bert Snow; secretary, Wm. A. Hopper; treasurer, H. Albright.

THORNTOWN, IND.—The Thorntown Co-operative Telephone Co. has elected J. E. Boyer, president, and L. W. Reesley, secretary.

GRINNELL, IOWA.—The stockholders of the Interior Telephone Co. held their annual meeting at which the directors and officers were elected for the coming year: President, H. L. Beyer; vice-president, C. R. Clark; treasurer, C. W. H. Beyer; directors, Wesley Manatt, J. P. Lyman and L. G. Pierce.

LE CLAIRE, IOWA.—At the meeting of the Le Claire Independent Telephone Co. the following officers were elected for the ensuing year: President, J. L. Brown; vice-president, R. C. Hulet; secretary, C. C. Hileman; treasurer, J. L. Meyer; directors, F. C. Michael, H. H. Dittmer and F. E. Speer.

RINGSTED, IOWA.—At the recent meeting of the stockholders of the Ringsted Telephone Co. the following directors were elected: J. Bonnickson, C. Anderson, H. J. Fink, C. Christensen and A. Nelson.

RUSSELL, KANS.—The Russell Telephone Co. held its annual election recently with the following results: H. A. Frier, president; H. M. Lang, vice-president; I. S. Fleck, secretary; V. K. Hoover, treasurer. A 6 per cent. dividend was declared, payable May 1.

WATERVILLE, ME.—The annual meeting of the Kennebec Farm & City Telephone Co. was recently held at which G. W. Matter was elected president and F. L. Ames, treasurer.

CASS CITY, MICH.—At the annual meeting of the Cass City Telephone Co. J. D. Brooker was chosen president; J. D. Crosby, vice-president; E. H. Phinney, treasurer; J. C. Corkin, secretary. The annual dividend of 7 per cent. was declared.

DAKONVILLE, MICH.—The Farmers' Telephone Co. recently elected its officers for the ensuing year as follows: President, Wm. Carroll; vice-president, Robert Kirkpatrick; secretary-treasurer, W. R. Young.

MORRICE, MICH.—At a meeting of the North Morrice Telephone Co. the officers were elected as follows: President, Reynard Seigles; secretary, Fred Stone; treasurer, Rowland, Hinkley.

PLUMMER, MINN.—At the annual meeting of the Clearwater Farmers Telephone Co. the officers for the coming year were elected as follows: C. G. Sall, president; H. J. Enderie, vice-president; P. S. Medthill, secretary-treasurer.

SPRINGPORT, MICH.—The Springport Mutual Telephone Co. elected the following officers for the coming year: President, C. Ludlow; secretary-treasurer, F. Boatman; directors, Wm. Cortwright, B. Rindler, J. Clawson, Bert Yost, J. G. Colestock, W. Thuma and W. H. Davis.

CYRUS, MINN.—The stockholders of the Cyrus Mutual Telephone Co. elected H. C. Estby, president; P. O. Lee, vice-president.

SEDALIA, MO.—The stockholders of the Sedalia Home Telephone Co. met recently and elected the following directors for the ensuing year: W. D. Orthwein, H. L. Reber, W. H. Bassett, J. H. Komar, H. G. Fadeley and S. R. Smith.

LARUE, OHIO.—The annual stockholders' meeting of the Larue Telephone Co. was recently held and directors and officers for the ensuing year have been elected as follows: J. H. Leonard, president; C. F. Stahl, vice-president; W. F. Kniffin, secretary-treasurer; W. H. Johnston, W. E. Denman, C. H. Virden and W. C. Crager, directors.

LEROY, OHIO.—The Leroy Telephone Co. held its annual meeting recently and elected the following directors: S. Pomeroy, L. Quine, H. Tyrrell, E. Beasdsley and Lee Cattow.

CANONSBURG, PA.—The stockholders of the Farmers' Mutual Telephone Co. held a meeting recently at which the following officers were elected for the coming year: R. L. Munce, president; R. B. Blaney, vice-president; B. K. McConnell, secretary; John Fulton, treasurer.

CLARKSVILLE, PA.—The Mutual Telephone Co. met recently and elected the following officers for the ensuing year: President, D. M. Horn; vice-president, D. A. Arnold; secretary, A. Adelman; treasurer, O. E. Ross.

NASHVILLE, TENN.—At the annual meeting of the directors of the Cumberland Telephone & Telegraph Co. the following officers were elected for the coming year: President, W. T. Gentry; vice-president, J. E. Brown; treasurer, J. M. Hoxey; secretary, A. Maupin.

RIDGEFIELD, WASH.—The annual meeting of the Ridgefield, Sara & Vancouver Farmers' Union Telephone Co. was held recently and election of officers resulted as follows: J. W.

Blackburn, president; D. G. Converse, vice-president; F. E. Royle, secretary; N. S. Allen, treasurer.

ROSALIA, WASH.—The stockholders of the Rosalia Telephone Co. elected the following officers and directors at their annual meeting recently: R. P. Turnley, president; F. J. Wilmer, secretary; M. Meuli, treasurer; P. Proff, A. H. Gustin, M. W. Merritt and H. Mumm, directors.

PLATTEVILLE, WIS.—At the annual meeting of the Platteville Telephone Co. the following officers were elected for the term of one year: President, N. E. Atkinson; vice-president, L. L. Hake; secretary, A. O. Schultz; treasurer, W. H. Doyle.

REDGRANITE, WIS.—At the annual meeting of the Redgranite Telephone Co. T. R. Durkee was elected president; J. L. Kossel, secretary-treasurer; F. C. Miller, H. E. Frisbie, J. Piechowski and O. Lungwitz, directors.

VAN DYNE, WIS.—At the annual meeting of the Van Dyne Telephone Co. the following officers were elected: President, Charles Tank; vice-president, Edward Zentner; secretary, Henry Kraemer; treasurer, John Kind.

WAUSAU, WIS.—The Marathon County Telephone Association held its annual meeting recently at which a dividend of 10 per cent. was declared. The following officers were elected for the coming year: President, F. P. Stone; vice-president, F. F. Chesak; secretary, C. S. Gilbert; treasurer, A. L. Kreutzer.

Financial.

MONTREAL, CAN.—The Bell Telephone Co. of Canada has declared a dividend of 2 per cent., payable April 15 to stock of record March 25.

SAN FRANCISCO, CAL.—The Pacific Telephone & Telegraph Co. has declared a dividend of $1.50 per share on preferred stocks, payable April 15 to stock on record March 31.

MCCONNELL, ILL.—The McConnell Telephone Co. has increased its capital from $1,000 to $7,000.

BOSTON, MASS.—The New England Telephone & Telegraph Co. has declared its regular quarterly dividend of $1.75, payable March 31.

DETROIT, MICH.—The Michigan State Telephone Co. has declared a regular quarterly dividend of 1½ per cent.

CINCINNATI, OHIO.—The Cincinnati & Suburban Bell Telephone Co. has declared a quarterly dividend of 2½ per cent., payable April 1 to stock of record March 25.

NEW YORK, N. Y.—The American Telephone & Telegraph Co. has declared its regular quarterly dividend of $2 a share, payable April 15.

AUGUSTA, WIS.—The Augusta Telephone Co. has increased its capital stock from $40,000 to $55,000.

Franchise.

PAWNEE, ILL.—The Christian County Telephone Co. has been granted a franchise to construct and operate a telephone system in the town of Humphreys.

SMITHLAND, KY.—The Home Telephone Co. has applied to the city board for a 20 year franchise to operate a telephone exchange here.

HARRINGTON, WIS.—The Farm & City Telephone Co. has been granted a 10 year franchise to run its line into this town.

Miscellaneous.

BERRY, ALA.—The Berry Telephone Co. has been taken over by the Farmers' Co-operative Telephone Co. The plant is being entirely overhauled and rebuilt.

RED BLUFF, CAL.—The Tehama County Telephone Co. has been sold to the Sacramento Valley Telephone Co. for a consideration of $57,000.

UNION, NEBR.—The Union Mutual Telephone Co. has bought the interest of the Lincoln Telephone & Telegraph Co. in this territory.

PORTAL, N. D.—The Clyde Telephone Co. has been purchased by the Farmers' & Merchants' Telephone Co. for a consideration of $5,000.

STEAMBURG, N. Y.—F. W. Gates, owner of the Steamburg Telephone Co. has bought the Seneca Independent Telephone Co. and consolidated the plants.

OGDEN, UTAH.—The Mountain States Telephone & Telegraph Co. is planning improvements to the extent of $100,000 this spring, including a large amount of underground work.

CHILTON, WIS.—The Eastern Wisconsin Telephone Co. has sold its Lakewood Beach line to the Wisconsin Telephone Co.

MATTOON, WIS.—The Mattoon Telephone Co. has extended its line to Bowler where it will connect with the Morris lines.

Guard Your Lines

Protect your signal and telegraphic instruments against dynamic and static influences by guarding them with

Brach Non-Air Gap Lightning Arresters

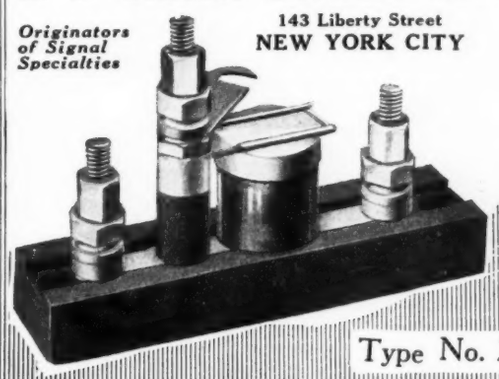
Service records have proven them to successfully meet extreme conditions.

They cannot become grounded and their composition permits heavy discharges to pass through without fusing. Write for our catalog that explains "WHY." Complete line of Non-Air Gap and Vacuum Arresters.

L. S. BRACH SUPPLY CO.

Originators of Signal Specialties

143 Liberty Street
NEW YORK CITY



Type No. 24

The Use of Toll Circuits

Is the stock in trade of a Telephone Company.

It is that which the company sells to the public at so much per minute, and as such it represents money just as fully as does the stock carried by any merchant.

The public should pay for all it takes.

The Calculagraph

tells exactly how much use of a toll line is chargeable to the public including excess or over time.

It prints **Elapsed Time.**

It makes no clerical errors.

Calculagraph Company

1416 Jewelers Building, New York City

The Triple Alliance in Space Buying and Selling

Advertiser, Agent and Publisher find A. B. C. Service of mutual profit because—

A. B. C. Service means hard cold facts about circulation—quality, quantity and distribution. It assembles figures, checks them, verifies them—puts them in standardized form so you can analyze them at a glance.

Results come from A. B. C. Service—no guesswork, no theory, just facts. You want facts about circulation because they mean well spent appropriations for the Advertiser, efficient service for the Agent, increased business for the Publisher. A. B. C. Service is the only logical answer to the space buying problem.

The Audit Bureau of Circulations is a co-operative organization—not for profit—its membership includes nearly one thousand Advertisers, Advertising-agents and Publishers, pledged to buy and sell circulation on a commodity basis—both as to quality and quantity. Complete information regarding the service and membership may be obtained by addressing—Russell R. Whitman, Managing Director,

Audit Bureau of Circulations

330-334 Railway Exchange Bldg., Chicago

—Telephony is the only Telephone paper which is a member of the A.B.C.